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REPORT

OF THE

SUDAN MEDICAL SERVICE

FOR THE YEAR

1937

McCorquodale & Co. (Sudan) Limited, Khartoum

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ANNUAL REPORT 1937.

SUDAN MEDICAL SERVICE.

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ANNUAL REPORT
OF THE SUDAN MEDICAL SERVICE
FOR THE YEAR 1937.

GENERAL HEALTH.

The public health of the Sudan was satisfactory throughout the year. The incidence of malaria, which was high in the northern Sudan at the end of 1936, rapidly fell in January, 1937 and remained below average for the remainder of the year.

The Sudan was spared the devastating epidemics of cerebrospinal meningitis which ravaged the Western Provinces during the dry season of the previous three years, although sporadic cases were reported over a large area and a small outbreak occurred in the Aweil district of Equatoria Province. Sporadic cases and small outbreaks of smallpox and relapsing fever were reported in Blue Nile, Kassala, Darfur and Kordofan Provinces during the second half of the year. Infection was introduced by immigrants from Eritrea and Abyssinia.

HEALTH OF OFFICIALS.

RACE	Number of Officials employed	Total		Average days' sickness		Died	Invalided
		Placed on sick list	No. of days' sickness	For all officials	For those who were sick		
British	849	159	978	1.15	6.15	1	1
Sudanese	4,243	821	6,721	1.58	8.18	6	11
Egyptians	539	91	724	1.34	7.95	—	8
Syrians	45	11	84	1.87	7.63	—	—

The comparative figures for the past five years are as follows :—

	1933	1934	1935	1936	1937
British.					
Days Sickness	1.26	1.33	1.32	1.56	1.15
Died	2	2	1	2	1
Invalided	4	2	3	2	1
Sudanese.					
Days Sickness	1.65	1.56	1.42	1.48	1.58
Died	10	8	5	14	6
Invalided	6	7	13	4	11
Egyptians.					
Days Sickness	1.21	1.09	1.17	1.66	1.34
Died	4	3	3	4	—
Invalided	1	—	1	2	8
Syrians.					
Days Sickness	0.80	2.43	0.22	0.16	1.87
Died	—	—	—	—	—
Invalided	—	—	—	—	—

Assuming that a British official works for nine complete months in the year, the total number of days lost by sickness in 1937 is equivalent to the loss of 3.5 officials and compares with previous years as follows :—

1932	5.9	1935	3.9
1933	3.6	1936	4.6
1934	3.8	1937	3.5

PROGRESS OF WORK.

Medical work carried out in hospitals and dispensaries continues to increase. It is not intended to increase facilities for treatment in future as the present network provides an adequate epidemiological intelligence system and brings medical treatment within reasonable reach of the whole population.

Preventive medicine continues to develop and an adequate supervisory sanitary staff is being trained as rapidly as possible to meet the requirements of the whole country.

EPIDEMIC DISEASES.

Cases of cerebrospinal meningitis were reported from every province but, fortunately, with the exception of a small outbreak in Equatoria Province, the disease remained sporadic. A few isolated cases of diphtheria were reported.

West African immigrants with relapsing fever provided a constant stream of infection to Kassala and Blue Nile Provinces throughout the year. Every precaution was taken to prevent the disease from spreading westwards. Fortunately it remained sporadic with the exception of an isolated outbreak, quickly controlled, in Darfur. There was a low mortality partly because facilities for treatment were available for most of the cases.

An epidemic of smallpox, which was raging in the relatively inaccessible country south of Roseires in the Blue Nile Province, was stamped out with great difficulty during the first half of the year.

Further North, in August, the Sudan was again infected with this disease from Abyssinia and in addition from Eritrea. West African immigrants, who had been infected outside the Sudan, developed the disease in Kassala Province and the Gezira. Despite extensive vaccination, the disease was kept under control with difficulty, as a constant stream of infection was entering the Sudan among a wandering homeless population. 561,196 vaccinations were carried out during the year.

ENDEMIC DISEASES.

Schistosomiasis is now of little importance to the public health of the Sudan but in certain areas, notably the Gezira, it is only by constant efforts that it is possible to keep down the incidence and prevent the repeated infection which causes so much morbidity and even mortality among the population at risk.

The incidence of kala-azar shows an increase particularly in the Sennar and Singa districts of Blue Nile Province, the northern part of Upper Nile Province, and the Gedaref district of Kassala Province. This may be partly due to the diagnosis of a larger number of cases, as special attention has been paid to this disease recently.

There is no evidence of any increase in the incidence of leprosy. New settlements were opened in the Nuba Mountains where the incidence has always been high.

Owing to well spaced rains and a regular fall of the river the incidence of malaria remained below average in the northern Sudan. The anti-malarial staff in this area has been considerably strengthened in recent years. The malariologist continues to carry out investigations in the Gezira and adjacent areas which are yielding results of practical application. Efforts have been made to popularise the use of insecticide and mosquito nets among the general population in every part of the Sudan.

Sleeping sickness remains endemic in the Zande district of Equatoria Province and it seems impossible to eradicate it completely owing to re-infection from outside the Sudan. Accordingly, it has been decided to relax considerably the irksome restrictions which the inhabitants have endured for so long, and, as an alternative, to concentrate on improving the efficiency of the measures which are considered essential and must remain in force. Special attention is also being paid to anti-tsetse fly work.

The incidence of tuberculosis shows no increase despite increasing risk of infection from outside the Sudan and it appears that the general raising of the standard of living is increasing the resistance of the population as a whole to the disease. In Wadi Halfa district, owing to constant infection from Egypt, the situation is disquieting.

QUARANTINE.

6,346 pilgrims left Suakin for Jedda, the largest number ever recorded. This year for the first time, calf lymph made at the Stack Laboratories was used for the vaccination of pilgrims with satisfactory results.

At Port Sudan quarantine no ships were quarantined and there were no cases of infectious disease from ships.

At Wadi Halfa 1,667 Egyptian labourers passed through the quarantine of whom 96 were treated for schistosomiasis either at Wadi Halfa or their destination.

TRAINING.

Eighteen students were under training at the Kitchener School of Medicine during the year. Eight sat for the examination in public health and pathology and seven passed. Eight students were examined in physiology and all were successful. Two candidates sat for the diploma of the Royal Sanitary Institute both of whom were successful.

The Graphic Museum continues to serve a most useful purpose in training students to learn by eye instead of by verbal memorisation.

Training courses were held for dispensers, sanitary overseers, female nurses, midwives, laboratory assistants, assistant medical officers, and hospital orderlies.

Two Sudanese doctors completed a three months post-graduate course in London during the year.

STACK LABORATORIES.

Investigations were carried out in the following problems :—

1. The possible existence of typhus fever and Weil's disease in the Sudan. The investigations showed no evidence of the presence of either.

2. Relapsing fever.

3. The possible existence of yellow fever in the Sudan. If the mouse protection test can be regarded as specific for yellow fever, it appears that there have been at least three human cases of yellow fever during the last two years.

4. The malaria research in the Gezira.

20,432 routine examinations were carried out during the year despite the fact that much routine work is now decentralised to province hospital laboratories.

1,000,000 units of vaccine lymph were made. Owing to the extensive vaccination campaign carried out during the latter half of the year, 500,000 units were issued in November and December alone.

EPIDEMIC DISEASES.

CEREBROSPINAL MENINGITIS.

446 cases were reported with 293 deaths. The incidence for the last nine years is :—

Year.	Cases.	Deaths.	Year.	Cases.	Deaths.
1929	464	340	1934	4231	3341
1930	865	665	1935	3249	2154
1931	348	240	1936	13440	8906
1932	532	384	1937	446	293
1933	166	131			

Cases were reported from every province in the Sudan and a small outbreak occurred in the Aweil district of Equatoria Province. The disease remained sporadic and showed no signs of assuming epidemic proportions.

DIPHTHERIA.

36 cases were reported with the following distribution :—

Blue Nile Province	5	Kordofan Province	1
Equatoria Province... ...	2	Northern Province	1
Kassala Province	3	Upper Nile Province ...	1
Khartoum Province ...	23		

No cases were reported in Amka, near Wadi Halfa, where for many years there has been a focus of infection.

On the other hand, the disease was reported for the first time in the Equatoria Province. An increase in the incidence of this disease is to be expected as the Sudanese come into closer contact with the outside world.

INFLUENZA.

Outbreaks occurred in all districts of Equatoria Province and the Nuba Mountains. The disease was of a virulent type, complications were common and a high mortality was reported.

Minor outbreaks of a mild type occurred in the northern Sudan during the winter months.

RELAPSING FEVER.

374 cases with 48 deaths were reported during the year with the following distribution :—

Province.	Cases	Deaths	Province.	Cases	Deaths
Blue Nile	191	12	Khartoum ...	3	1
Darfur	68	24	Kordofan	16	1
Kassala	95	10	Northern	1	—

At the beginning of the year cases of relapsing fever were being reported from the Kurmuk district of the Blue Nile Province along the Abyssinian border.

In January the disease was reported for the first time at Kassala, and in March in the Gezira. Although the disease remained sporadic the incidence slowly increased, and later in the year isolated cases were reported from Khartoum and Kordofan Provinces.

A small outbreak also occurred in the Kuttum district of Darfur Province in November.

The disease has been largely confined to and spread by West African immigrants from Abyssinia and Eritrea, and delousing stations were established to catch them at Kassala, Showak, Doka, Gedaref, Gallabat, Khartoum and Nahud.

All fourth class passengers on west bound trains were examined at Gedaref and deloused if necessary.

A routine re-examination of the fourth class passengers was carried out at Sennar, about twelve hours journey further west. This is the last station where labourers can be checked before entering the Irrigated Area of the Gezira. 70 cases of relapsing fever were taken off trains during the year.

Relapsing fever is difficult to control in the Sudan, as it is found that many persons, who are sufficiently fit not to report sick, carry the infection.

Many passengers on the trains at Sennar, who had been deloused and examined at Gedaref, were found to have slight fever with swarms of spirochaetes in the blood. Epidemics of this disease in recent years have resulted in appalling loss of life and devastation of entire districts.

There seems little doubt, however, that the present strain is less virulent than those of past epidemics, and the extensive network of hospitals and dispensaries enables outbreaks to be dealt with at once and affords facilities for early treatment of cases. As a result of all these factors it was possible to keep the disease under control and to avoid a heavy general or case mortality.

25,381 persons were dealt with at the delousing stations during the year.

SMALLPOX.

425 cases with 57 deaths were reported during the year, distributed as follows :—

Province	Cases	Deaths
Blue Nile	231	41
Darfur	1	—
Equatoria	28	—
Kassala	50	6
Khartoum	3	—
Kordofan	103	10
Upper Nile	9	—

The outbreak reported last year along the Abyssinian frontier at Gezzan and Kurmuk in the Blue Nile Province died down in March, although a small isolated outbreak was reported at Chali in the same district in November.

In all some 706 cases with 169 deaths were reported in this area ; of these, 205 cases with 37 deaths occurred in 1937.

Vaccination was carried out on a large scale under difficult conditions as the population of forest dwellers were shy, indifferent, difficult to control and resentful.

Arm to arm vaccination still survives in this remote region and gave considerable trouble to the public health staff.

In August an outbreak in a much more dangerous area occurred in Kassala Province and the Irrigated Area of the Gezira, spreading later to Kordofan Province and one village in Darfur.

West Africans on their way home, having left Abyssinia or Eritrea within the incubation period, developed the disease in Kassala, Gedaref, or the Gezira. The wandering homeless West Africans are liable to avoid hospitals and dispensaries and they cannot be effectively controlled.

An extensive vaccination campaign was organised and as far as possible all immigrants were rounded up and vaccinated at centres along the eastern border. All fourth class passengers on west-bound trains were vaccinated, if necessary, at Gedaref, and the trains were searched at Sennar for any missed cases. Drastic quarantine measures were out of the question as the West African immigrants would merely have evaded them, and if they had become alarmed, it would have been impossible even to vaccinate them. The disease was kept under control but with difficulty owing to the constant stream of infection invading the Sudan.

Cases of mild smallpox were reported from Wau and Rumbek district of Equatoria Province and from Malakal in the Upper Nile Province. The disease has been mildly epidemic in the Southern Sudan for many years and remains true to type. The mortality has always been very low.

561,196 vaccinations were carried out in the following Provinces :—

Blue Nile ...	311,881	Kassala	67,460	Northern ...	17,373
Darfur	242	Khartoum ...	56,297	Upper Nile ...	4,853
Equatoria ...	4,051	Kordofan ...	98,304	White Nile ...	735

ENDEMIC DISEASES.

ANCYLOSTOMIASIS.

The incidence of this disease remains negligible in the northern Sudan. It occurs in the Northern Province but is of no importance as regards public health. In Equatoria Province it is a serious problem in certain districts west of the White Nile, particularly Juba, Kajo-Kaji, Wau and Rumbek.

The usual measures are taken to reduce the incidence of the disease but the establishment of a satisfactory standard of village sanitation must be a slow process in primitive areas.

BLACKWATER FEVER.

20 cases were reported with 5 deaths.

The figures for the last six years are as follows :—

Year.	Cases.	Deaths.	Year.	Cases.	Deaths.
1932	66	23	1935	18	9
1933	38	12	1936	38	14
1934	34	9	1937	20	5

The race incidence in relation to the 12th parallel of North latitude was as follows :—

Race	North of 12th. parallel		South of 12th. parallel	
	Cases.	Deaths.	Cases.	Deaths.
Sudanese (Arab)	7	1	3	1
Sudanese (Negroid)...	1	—	3	1
Syrians	2	—	—	—
Greeks	2	1	—	—
Italians	—	—	1	1
Indians	1	—	—	—
TOTAL	13	2	7	3

The percentage of cases occurring south of the 12th parallel for the last six years is as follows : —

Year.	%	Year.	%
1932	59	1935	62
1933	60	1936	42
1934	59	1937	35

DRACONTIASIS.

This disease remains prevalent in the southern Sudan and Nuba Mountains.

In the Juba and Yei districts progress has been made in a programme of special well construction. In the Nuba Mountains the population depend to a large extent on rock pools and water holes for their water supply and all that can be done is to attempt, by propaganda, to avoid infection of the water supplies and, by treating patients suffering from the disease, to reduce the probability of further infection.

Province.	Cases treated	Province.	Cases treated
Blue Nile	19	Khartoum...	1
Darfur	58	Kordofan	110
Equatoria...	2,744	Northern	Nil
Kassala	Nil	Upper Nile	37
Total	2,969		

DYSENTERY.

2,642 cases were admitted to hospital of whom 2,504 were diagnosed as amoebic and 138 as bacillary dysentery.

Admissions to hospital show a slight decrease. Dispensaries in the rural district of Khartoum and Upper Nile Provinces, however, report a considerable increase in the number of outpatients seeking treatment for amoebiasis.

The following table shows the admissions to hospital from each of these two diseases given as the percentage of the total admissions for all causes for 1937 and the preceding nine years.

	1928	1929	1930	1931	1932	1933	1934	1935	1936	1937
Amoebic Dysentery ...	3.40	3.02	2.68	3.28	2.51	3.25	3.00	2.83	2.49	2.48
Bacillary Dysentery ...	0.80	0.75	0.37	0.41	0.41	0.38	0.28	0.26	0.18	0.13
Total ...	4.20	3.77	3.05	3.69	2.92	3.63	3.28	3.09	2.67	2.61

ENTERIC FEVER

165 cases of typhoid and paratyphoid fevers were reported with 17 deaths.

Cases reported during the past ten years are as follows :—

1928	132	1933	204
1929	86	1934	188
1930	73	1935	246
1931	100	1936	135
1932	85	1937	165

This disease was prevalent in Merowe district from July to September where 32 cases were reported compared with 1 case in 1936. Sporadic cases were reported from towns in the northern Sudan.

HYDATID DISEASE.

26 cases were reported in the Kapoeta district in 1937 compared with 10 in 1936, 8 in 1935, and 24 in 1934. One case was admitted to Wau Hospital from Raga and a sporadic case, apparently infected in Suakin, was reported from Port Sudan.

LEISHMANIASIS.

336 cases were reported compared with 214 in 1936, 171 in 1935 and 289 in 1934.

Although the incidence of this disease appears to be increasing, it is difficult to assess how far the increase is due to a larger number of cases reported as a result of the development of medical work in the areas where the disease occurs and to the fact that special attention has been paid to kala-azar in the Sudan in recent years.

Cases are reported from every province but mainly from an extensive endemic area in the eastern Sudan along the Eritrean and Abyssinian frontiers.

328 cases of kala-azar were reported, 2 of espundia from the Fung area, and 6 of dermal leishmaniasis from the western Sudan.

BLUE NILE PROVINCE.

148 cases were reported compared with 111 in 1936. An increase is reported in the number of cases treated in the Sennar and Singa districts and it appears that the endemic centre is moving north.

Treatment with the organic preparations of antimony is effective and relapses are rare. Of 43 cases treated in the Dar Agil area since 1934 only three are known to have relapsed and the remainder, as far as can be ascertained, are free from symptoms.

KASSALA PROVINCE.

An increase in incidence is reported in Gedaref, both among the civil population and the troops. 40 cases were notified as compared with 13 in 1936. The majority of cases occurred during the rainy season.

EQUATORIA PROVINCE.

80 cases were reported in the Taposan country compared with 52 in 1936. 14 of these came from the Boya Hills, a new area where the disease appears to be endemic.

DISTRIBUTION.

The following table shows the incidence by age and sex in the various endemic areas :—

PROVINCE.	DISTRICT.	SEX		AGE INCIDENCE.							
		Male	Female	0-1	1-5	5-15	15-25	25-35	35-45	45-65	Over 65
Blue Nile	Fung ...	109	25	1	17	37	40	23	10	6	—
	Gezira ...	13	1	—	—	4	5	4	1	—	—
Darfur	El Fasher	7	1	—	—	2	3	1	1	1	—
Equatoria	Kapoeta	58	22	—	8	45	17	6	4	—	—
	Torit ...	1	—	—	—	—	—	1	—	—	—
Kassala	Kassala ...	10	—	—	—	1	5	2	2	—	—
	Gedaref ...	47	3	—	—	2	26	19	2	—	1
Khartoum	Khartoum	3	—	—	—	1	—	2	—	—	—
	Omdurman	6	—	—	—	1	2	2	1	—	—
Kordofan	El Obeid	7	1	—	—	2	3	3	—	—	—
Northern	Merowe	1	—	—	—	—	1	—	—	—	—
Port Sudan	Port Sudan	5	—	—	—	—	3	1	—	1	—
Upper Nile	Malakal ...	12	—	—	—	2	7	3	—	—	—
White Nile	Dueim ...	4	—	—	—	1	2	1	—	—	—
	TOTAL ...	283	53	1	25	98	114	68	21	8	1

RACE.

The races affected were :—

Sudanese (Arab)	184	Eritreans	3
Sudanese (Negroid)	127	Abyssinians	2
West Africans	18	Somalis...	2
Total	336		

RESULTS OF TREATMENT.

Analysis of the treatment results for the year shows that :—

124 cases or 37% were apparently cured.
57 ,, or 17% died.
95 ,, or 28% were still under treatment.
60 ,, or 18% had not completed treatment and could not be traced.

LEPROSY.

At the end of the year 2,224 lepers were in camps or settlements and 126 were under observation and treatment.

The distribution of leprosy in the Sudan is estimated as follows :—

Province.	In camps or settlements		Under observation and treatment as hospital or dispensary outpatients	Total under treatment	Under observation but not under treatment	Estimated number of further cases	Estimated total number of cases
	Segregated	Under treatment but not segregated					
Blue Nile ...	38	2	16	56	—	152	208
Darfur	45	—	—	45	3	1000	1048
Equatoria	443	1465	1	1909	2558	1326	5793
Kassala	—	33	3	36	1	—	37
Khartoum ...	—	—	31	31	—	—	31
Kordofan	187	7	19	213	1085	90	1388
Northern	—	—	24	24	41	16	81
Upper Nile... ...	—	—	6	6	—	100	106
White Nile... ...	—	4	26	30	—	—	30
	713	1511	126	2350	3688	2684	8722

7 new leper settlements were opened during the year in the Nuba Mountains making 10 in all. The whole area is now covered and it remains to persuade the lepers to take advantage of the facilities offered.

All the settlements are run on an entirely voluntary basis and it is expected that, by making them attractive with good housing, gardens, extra rations and facilities for treatment, it will be possible to draw a large percentage of lepers from the hills and to persuade cases to remain in the settlement. In this way a proportion of the infectious lepers will be isolated, and it is hoped as a consequence that the incidence of the disease will gradually decline among these shy, primitive people.

The system of home isolation continues to work satisfactorily in the towns of the northern Sudan and, with all its defects, is more satisfactory and humane than any system of compulsory or voluntary segregation.

As regards the southern Sudan, where the incidence is high, the large settlements of Li Rangu and Source Yubu continued to function satisfactorily.

There is no evidence of any increase in incidence and it appears that situation as regards this disease is as satisfactory as can be expected. Experience in the Sudan indicates that, in areas where the incidence of leprosy is high, the disease should be treated as a public health rather than a medical problem. Although treatment is and should be given where indicated, it must necessarily be mass treatment in a settlement such as Li Rangu with 1,245 lepers. The benefit to the community is that all the infectious lepers of the area are concentrated in a settlement. The important consideration is to keep as large a percentage of the infectious lepers under observation and isolation as possible and this factor should dominate policy, not the largest number it is possible to treat individually.

In any case the results of the therapeutic treatment have been disappointing in the Sudan, as in other parts of Africa.

It is considered that the permanent eradication of leprosy will only come with a general improvement of the standard of living, which should be the objective of every public health service and administration. Much has already been done to raise this in the Sudan and care must be taken to resist the medical and humanitarian urge to spend money on direct medical work which could be better spent on improving nutrition, water supplies, housing and village sanitation.

EQUATORIA PROVINCE. (Eastern Districts)

	Remaining on 1.1.1937.	Admitted	Discharged	Died	Remaining on 1.1.1938.
Yei	110	2	64	13	35
Opari ...	26	32	49	3	6
Loa ...	34	97	118	3	10
Kajo Kaji ...	50	38	24	9	55
Tolliang ...	29	2	10	2	19
Koggi ...	31	34	30	5	30
Rumbek ...	39	18	14	3	40
				TOTAL	195

Yei. The Medical Officer estimates the progress of cases admitted before 1937 as follows:—

	Improved	Stationary	Worse
Yei	23%	36%	41%
Kajo-Kaji	17%	17%	66%

Yambio District—Li Rangu. 2,558 cases of early leprosy remain on the register and are under observation.

The majority have been under inspection since 1930. 295 new cases were registered this year.

In addition Li Rangu settlement contains 1,245 lepers and Meridi 89, making a total of 3,892 in this area.

At Li Rangu 189 cases are segregated.

Source Yubo. A new camp has been built for the segregated lepers at Bariabandi, close to the leper settlement proper. 352 lepers were in the settlement during the year, of whom 88 were segregated.

Wau.

	Remaining 1-1-1937	Admitted.	Discharged.	Died.	Remaining 1-1-1938
Men	22	14	12	3	21
Women ...	10	2	1	1	10
Children ...	4	6	6	—	4
	36	22	19	4	35

MALARIA.

The incidence of malaria, which had been high in the northern Sudan at the end of 1936 owing to unfavourable climatic conditions, fell in January and remained below average.

Well spaced rains and a regular fall of the river resulted in an exceptionally low incidence of malaria during the last six months of the year.

BLUE NILE PROVINCE.

The anti-malarial precautions taken in the irrigated area of the Gezira increase in efficiency year by year as the people become accustomed to carry them out and as experience and research enable improvements to be made.

The investigations carried out by the medical entomologist during the last two years on the mosquito vector are already yielding results of practical application.

The irrigated area, which has now reached about 900,000 acres, presents ideal conditions for the spread of malaria, and the Sudan owes a debt to those who at the commencement of the scheme ten years ago had the foresight to realise what was at stake as regards health of the inhabitants and to insist that the most stringent anti-malarial measures should be taken from the start. Taking acute and chronic malaria into account there is undoubtedly far less mortality from malaria than before the scheme commenced and although there was a rise in the incidence of chronic malaria when the scheme started, each year the situation is becoming more satisfactory in this respect.

The incidence in Medani and the Gezira showed a considerable decrease compared with 1936.

	1936		1937	
	Cases	Deaths	Cases	Deaths
Wad Medani Hospital ...	1177	7	465	—
Wad Medani outpatients	5033	—	2449	—
Gezira Dispensaries ...	27125	—	17422	—

Malignant Tertian is the prevailing infection and the figures of the various types found on microscopic examination are as under.

Malignant Tertian	*Benign Tertian*	*Quartan*
973	101	122

KORDOFAN PROVINCE.

The incidence was less than in 1936 owing to well spaced rains and increased anti-mosquito measures.

KASSALA PROVINCE.

In Kassala Town fewer cases were reported than in 1936 which is attributed to more effective anti-mosquito work and a lower peak of the Gash flood which runs through the town.

NORTHERN PROVINCE.

The incidence of malaria was below average owing to the regular fall in the level of the river in the autumn.

The number of anti-malarial subordinate staff has been increased during the last two years in certain districts and an effort is now made to deal with the mosquito problem in all inhabited reaches of the river. The cataract country near Merowe provides an almost insoluble problem owing to the enormous number of pools left by the river as it falls, but fortunately the population is very sparse.

Particular attention has been paid to the islands north of Dongola, where malaria has always been prevalent in the past.

GENERAL.

Although much has been done to protect the northern riverain and urban population and those living in certain special areas such as the Gezira and pump schemes, the fact remains that little can be done to reduce the mosquito incidence in large areas in the central and southern Sudan. The problem is however being tackled on different lines. Every effort is being made by propaganda to make inhabitants of these areas mosquito conscious, so that they will buy mosquito nets for themselves and their families and the cheap insecticide and sprayers which have been specially provided at a price they can afford. Destruction of, and protection from the domesticated mosquito should have marked results in reducing the incidence of malaria in these regions. The improvement in housing conditions, which is slowly taking place, will also have its effect.

The following table shows the spleen rate of children examined in the intermediate and village schools during the last three years. In the northern Sudan these figures provide a fairly accurate index of the endemicity of malaria, but in the southern provinces where schools are few and where the children examined are, to some extent living under protected conditions, the spleen rate does not indicate the incidence of malaria, which is high throughout the area.

% SPLEEN RATE			PROVINCE & DISTRICT	TYPE OF PARASITE, 1937		
1935	1936	1937		% Benign	% Malignant	% Quartan
			NORTHERN PROVINCE.			
3.2	0.7	7.8	Wadi Halfa	51.4	48.6	—
11.0	16.1	16.8	Dongola	54.1	42.2	3.7
10.0	14.0	13.2	Berber	33.3	66.4	0.3
0.8	2.7	2.7	KHARTOUM PROVINCE.	23.2	76.2	0.6
			KASSALA PROVINCE.			
1.0	1.6	10.1	Port Sudan	31.7	66.3	2.0
21.0	23.7	27.8	Kassala	56.2	42.6	1.2
			BLUE NILE PROVINCE.			
26.9	19.4	16.6	Blue Nile	15.6	82.1	2.3
56.4	47.2	46.9	Fung	37.7	62.2	0.1
31.6	37.4	29.0	White Nile	46.4	53.4	—
32.2	41.1	32.2	KORDOFAN PROVINCE.	19.7	78.9	1.4
33.2	35.8	46.9	DARFUR PROVINCE. ...	28.9	71.0	0.1
22.3	21.1	17.9	UPPER NILE PROVINCE.	11.7	86.2	2.1
			EQUATORIA PROVINCE.			
11.6	23.5	20.7	Mongalla	24.4	74.7	0.9
19.3	19.4	17.7	Bahr-el-Ghazal ...	61.0	39.0	—

RABIES

The incidence of this disease is increasing.

Year	Number of persons receiving treatment	Deaths despite treatment	Total deaths
1932	226	4	8
1933	75	6	12
1934	198	6	8
1935	290	4	10
1936	373	1	8
1937	534	6	11

Of those successfully treated, 145 had come in contact with rabid animals and 383 were actually bitten. Two cases were bitten by a rabid man and the remainder by the following animals :—

Dogs	Donkeys	Camels	Cows	Cats	Jackals
351	10	2	2	15	1

The following data is available as regards the fatal cases :—

Locality.	Age	Sex	Biting animal	Site of bite	Severity of Bite.	No. of days after bite when treatment was begun	No. of injections given	No. of days from bite to fatal termination.
(a) Those Treated.								
Darfur	8	Male	Dog	Face	Superficial	21	14	38
Darfur	7	Male	Dog	Face	Skin and muscles	30	14	50
Kordofan	30	Male	Dog	Upper lip	Superficial	3	8	10
Kordofan	27	Male	Dog	Face	Superficial-healed	17	3	19
Blue Nile	30	Male	Camel	Elbow	Very severe....	1	5	6
Upper Nile	—	Female	Dog	—	—	90	4	94
(b) Those not Treated.								
Blue Nile	35	Male	Dog	Leg	Superficial	—	—	90
Kordofan	35	Male	Dog	Thigh	Severe	—	—	60
Kordofan	35	Male	Dog	Hand	Severe	—	—	120
Upper Nile	—	Male	Dog	—	—	—	—	—
Upper Nile	—	Female	Wild cat	—	—	—	—	—

A case of canine rabies has been confirmed pathologically for the first time from the Zande district where, although there is reason to believe that the disease has been prevalent among dogs in the past, no cases appear to have occurred among the tribesmen who live in close association with them.

It is suggested that this may be a strain of virus similar to that described in French Equatorial Africa which has a very low infectivity to man.

ACUTE RHEUMATISM.

274 cases with 2 deaths were reported against 288 cases with five deaths in 1936.

The distribution of the cases was :—

Province.	Cases.	Province.	Cases.
Blue Nile	54	Kordofan	29
Darfur	12	Northern	68
Equatoria	18	Upper Nile	8
Kassala	33	White Nile	5
Khartoum	47		

SCHISTOSOMIASIS.

This disease is now of little public health importance in the Sudan. Annual examination of the population over a long period, with treatment of cases found, has reduced the incidence in the Dongola and Merowe district to negligible proportions. The same result is being aimed at in Wadi Halfa district. The stringent measures taken to protect the irrigated area of the Gezira from infection during the last ten years have proved successful. The disease elsewhere is of little importance except in the Dueim and Kosti districts. Here, although the incidence is reduced, it is still the cause of a certain number of admissions to hospital.

This area will receive special attention from the public health staff during the next few years and it is hoped that, by resiting villages and providing proper village water supplies and latrines where indicated, the incidence and intensity will diminish considerably.

NORTHERN PROVINCE.

Dongola and Merowe Districts. (Schistosoma haematobium). A yearly survey is carried out in these districts and the comparative figures for the last ten years are :—

YEAR	Number examined	Infections found	Percentage	YEAR	Number examined	Infections found	Percentage
1928 ...	12,213	2,259	18.0	1933 ...	58,711	1,825	3.1
1929 ...	17,925	2,187	12.0	1934 ...	46,054	1,768	3.8
1930 ...	26,094	2,443	9.3	1935 ...	40,950	1,408	3.4
1931 ...	37,405	1,765	4.6	1936 ...	37,334	1,268	3.4
1932 ...	49,077	2,470	5.0	1937 ...	46,741	1,155	2.5

Wadi Halfa District. (Schistosoma haematobium.) The results of the campaign in this district, organised four years ago and as shown by figures of the yearly survey, are as follows :—

YEAR	Number examined	Infections found	Percentage	YEAR	Number examined	Infections found	Percentage
1934 ...	20,180	3,927	19.4	1936 ...	12,437	1,439	12.9
1935 ...	12,076	2,613	21.6	1937 ...	18,498	2,002	10.8

BLUE NILE PROVINCE.

Gezira. (Schistosoma haematobium.)

The situation as regards this disease is satisfactory. Although the percentage for Blue Nile children shows a slight increase, this can be partly attributed to a more thorough survey, and the percentage in any case is very low.

Dr. F. H. Goss, Senior Medical Inspector of this area, again points out that the permanent solution of the bilharzia problem is a good water supply, preferably from deep wells or piped from canals. This aspect of the problem is being dealt with.

The following figures show the incidence of the disease among the indigenous population since 1926 and the comparative figures for all cases since 1933 :—

YEAR.	ADULTS.			CHILDREN.			TOTAL.		
	No. Exmd.	No. Inftd.	%	No. Exmd.	No. Inftd.	%	No. Exmd.	No. Inftd.	%
1926	16,419	76	0.47	—	—	—	16,419	76	0.47
1929	—	—	—	2,341	37	1.60	2,341	37	1.60
1930	—	—	—	3,322	20	0.57	3,322	20	0.57
1931	11,102	84	0.75	6,895	51	0.74	17,997	135	0.75
1932	9,618	51	0.53	1,707	19	1.10	11,325	70	0.62
1933	14,188	28	0.20	3,288	27	0.82	17,476	55	0.31
1934	12,769	5	0.04	3.583	2	0.07	16,352	7	0.04
1935	13,902	8	0.06	2,945	12	0.40	16,847	20	0.12
1936	22,604	10	0.04	5,483	17	0.31	28,087	27	0.09
1937	30,768	26	0.08	10,038	63	0.62	40,806	89	0.22

WHITE NILE SUB-PROVINCE.

Both intestinal and vesical schistosomiasis are endemic in most parts of this area. The main preventive measures taken are treatment of cases and the provision of a protected well water supply as an alternative to that from the river.

The incidence has declined in recent years and most cases are so mild that they are unwilling to submit to treatment.

SCURVY.

19 cases were reported with no deaths.

SLEEPING SICKNESS.

EQUATORIA PROVINCE.

89 cases were reported compared with 150 in 1936. The following table shows the number of cases since 1918.

YEAR.	Tembura.	Yei.	Kajo-Kaji.	Nimule.	Yambio.
1918	255	32	42	2	—
1919	621	15	63	8	—
1920	192	32	54	2	—
1921	656	24	31	12	—
1922	434	7	68	35	—
1923	839	3	5	4	4
1924	276	—	82	9	14
1925	203	—	10	9	—
1926	79	—	3	—	—
1927	49	1	—	18	3
1928	26	1	—	—	2
1929	18	—	—	—	—
1930	37	—	—	—	1
1931	61	—	—	—	1
1932	49	—	—	—	14
1933	70	1	—	—	12
1934	20	4*	6†	—	2
1935	80	1	10	—	—
1936	142	—	8	—	—
1937	63‡	2§	23	—	1

† Infected in Uganda.

‡ 2 contracted in French Equatorial Africa

* 3 contracted in Belgian Congo.

§ One contracted in Uganda.

The disease was reported from two areas, Source Yubo in the Zande District and in the Yei—Kajo-Kaji District.

Source Yubo. 63 cases were reported as compared with 142 in 1936. The disease has been endemic in this area for twenty years despite all efforts to eliminate it.

The most rigorous and irksome restrictions have been imposed over a long period and it is only to be expected that the population is becoming weary and apathetic.

Lt.-Col. Maurice, D.S.O., M.C., who had served in this area some 14 years ago, inspected and reported on the present situation early this year.

The conclusions which he reached in consultation and agreement with the local medical and administrative authorities were that in view of the constant risk of infection from heavily infected regions outside the Sudan, where the problem is almost insoluble, it would be impossible to eliminate the disease entirely, and if even more drastic measures were taken, the result might well be that the inhabitants would leave the Sudan for a time, only to return a few years later and re-introduce the disease from outside the country. Consequently the policy recommended was to maintain and intensify precautions such as the distribution of population in selected areas, clearing of streams and regular inspections so that it would be impossible for any big outbreak to occur, but to relax certain measures which are definitely irksome to the inhabitants such as very frequent routine inspections and retaining cases in hospital for long periods.

It was hoped that, as it would be possible to insist on an even more rigorous application of these precautionary measures which it was necessary to retain, the disease would actually be more effectively dealt with than at present.

With this end in view an additional Assistant District Commissioner has been appointed to carry out the administrative work in connection with sleeping sickness prevention and the cadre of public health officials has been increased.

An interesting innovation has been the carrying out of sleeping sickness inspections in one chief's district by the native administration, aided by locally trained Zande subordinate medical staff only. The services of the qualified medical staff, who previously had always organised and conducted the inspections and maintained discipline through the chiefs, were dispensed with. The experiment has been successful and it is hoped to extend it to other areas as soon as Zande staff are available who can carry out the work, including the use of a microscope.

Another new development has been the treatment of sleeping sickness cases in outside dispensaries instead of bringing them to the central hospital in the settlement. Eleven cases were successfully treated in 1937 in this way.

It is worthy of note that cases found nearly always respond to treatment, and the mortality from the disease at present is low. This is probably due to the fact that cases are usually diagnosed at an early stage owing to the frequent routine inspections. In addition the disease may be of a mild strain.

At the same time more attention is being paid to the question of tsetse fly destruction. Thanks to the self sacrificing and pioneer efforts of the Royal Army Medical Corps doctors and their Syrian assistants, sleeping sickness was brought under control when it first invaded the Sudan 20 years ago and before it had assumed epidemic proportions. The Zande tribe, faced with extermination, were not only saved but by constant medical supervision were maintained in a relatively high state of health, with the result that the population has increased rapidly. We are now faced with the problem of siting with difficulty a population of 225,000 persons on roads away from water courses. Obviously the only way by which it will be possible to provide sufficient land in future will be by freeing areas from tsetse fly by special measures.

By the kindness of the Government of Kenya the services of Mr. C. B. Symes, skilled in this specialised branch of medical entomology, were put at our disposal for a month to advise in the organisation of a tsetse fly campaign.

The result of all these changes should be more effective control of the disease with much less inconvenience to the inhabitants of the area.

Yei District. A disturbing increase in incidence is reported from the Kajo-Kaji sub-district where 23 cases occurred during the year. 17 of these cases were from the Kakwa living at Kala Hill, where seven cases were reported in 1936.

It is now considered that the local fly is infected.

In spite of the pass system, illicit movement still takes place across the border into the heavily infected Aringa area of Uganda.

A thorough inspection of the whole district is being carried out at present.

GENERAL.

Sleeping sickness can never spread to any extent from Equatoria Province to any other province in the Sudan and, so far as the gambiense type is concerned, the disease must remain confined to the extreme south of that Province, as the Glossina palpalis is only found south of Wau and Juba.

Nevertheless, it is a menace to a thickly populated area and it is only possible to hold it in check by the constant efforts of a large medical and sanitary staff, assisted by the provincial authorities and the native administration.

441,037 palpations for sleeping sickness were performed during the year.

SYPHILIS AND YAWS.

One of the dramatic results of the penetration of medicine into Central Africa has been the rapid disappearance of yaws, and the Sudan has proved no exception.

Although it used to be reported in all parts of the Southern Sudan, causing terrible disability and misery, cases are now seldom seen except in remote areas.

Syphilis is prevalent throughout the country but fortunately it does not attack the Sudanese in a severe form.

TUBERCULOSIS.

883 cases were admitted to hospital of whom 488 were pulmonary and 395 non-pulmonary.

It appears that the incidence of tuberculosis in the Sudan is not increasing despite the growing risk of infection from abroad through greater contact with the outside world. Undoubtedly, the general raising of the standard of living, which has taken place during the last ten years, has increased the resistance of the population as a whole to the disease.

In Wadi Halfa district, however, the higher incidence of the disease among a population, whose standard of living is and must remain low owing to local conditions, is disquieting.

Owing to the impossibility of making a living at home a large part of the male population work as servants in Egypt whence many return, suffering from pulmonary tuberculosis, to infect the women and children and to die in their villages. The damp climate of Lower Egypt in particular predisposes them to this disease.

49 of the pulmonary cases were foreigners and 18 were Sudanese who had contracted the disease in Egypt. The nationality of foreigners affected was as follows :—

	Pulmonary	Non-Pulmonary		Pulmonary	Non-Pulmonary
West Africans ...	19	13	British	2	—
Abyssinians ...	9	10	Indians	2	—
Hedjazis and Yemenis	6	5	Egyptians ...	1	3
Somalis	5	—	Greeks	1	—
Eritreans	4	—			

The following table shows the admissions and percentage rate of tuberculosis to other admissions for the northern and southern Sudan for the last four years :—

	1934		1935		1936		1937	
	Pulmonary.	Non-Pulmonary.	Pulmonary.	Non-Pulmonary.	Pulmonary.	Non-Pulmonary.	Pulmonary.	Non-Pulmonary.
NORTHERN SUDAN.								
Admissions for TB	452	343	415	302	451	313	418	331
Total admissions	57,003		58,445		65,392		66,881	
%TB to total adms.	0.79	0.60	0.71	0.51	0.69	0.47	0.62	0.49
	1.39%		1.22%		1.16%		1.11%	
SOUTHERN SUDAN.								
Admissions for TB	105	94	86	69	68	36	70	64
Total admissions...	28,987		30,638		30,689		34,207	
%TB to total adms.	0.36	0.32	0.28	0.22	0.22	0.11	0.20	0.19
	0.68%		0.50%		0.33%		0.39%	

The following table shows the admissions for pulmonary and non-pulmonary tuberculosis in the last ten years and the percentage rate of tubercular cases to other admissions :—

YEAR.	Pulmonary.		Non-Pulmonary.		Total.	
	Admissions.	Percentage.	Admissions.	Percentage.	Admissions.	Percentage.
1928 ...	260	0.82	327	0.75	497	1.57
1929 ...	302	0.65	322	0.70	624	1.35
1930 ...	480	0.95	300	0.61	780	1.56
1931 ...	390	0.65	294	0.49	684	1.14
1932 ...	421	0.70	281	0.47	702	1.17
1933 ...	521	0.74	394	0.56	915	1.30
1934 ...	557	0.65	437	0.50	994	1.15
1935 ...	501	0.56	371	0.42	872	0.98
1936 ...	519	0.54	349	0.36	868	0.90
1937 ...	488	0.48	395	0.39	883	0.87

Comparative table shewing the occupation of persons affected with pulmonary tuberculosis in the northern Sudan during the last five years :—

OCCUPATION.	Cultivators	Nomads	Soldiers Sailors and Police	Day Labourers	Townsmen			Indigent and unemployed	Women not employed	Children	Total
					Artisans, Merchants and Shop-keepers	Clerical	Servants				
1932	87	8	12	66	94	–	-	72	41	—	380
1933	116	22	17	46	105	–	–	53	60	—	419
1934	124	25	5	57	110	–	–	47	79	5	452
1935	113	15	9	43	94	–	–	51	87	3	415
1936	104	8	14	53	99	–	–	73	96	4	451
1937	117	5	19	73	47	26	12	72	107	10	488

The term "townsmen" has this year been split up to indicate the occupational incidence.

Age Incidence.

The following table shows the incidence of cases and deaths from pulmonary tuberculosis by age :—

Age Periods	0–1		1–5		5–15		15–25		25–35		35–45		45–65		65 and over		Undefined.	
	C	D	C	D	C	D	C	D	C	D	C	D	C	D	C	D	C	D
Northern Sudan	—	—	2	2	7	3	79	15	170	37	67	15	59	22	14	5	20	26
Southern Sudan	—	—	—	—	1	—	18	5	26	7	15	6	10	5	—	—	—	—

TUMOURS.

748 cases were admitted, classified as follows :—

Malignant	Carcinoma	106	
	Sarcoma	41	 177
	Unclassified	30	
Benign			571

The following are the comparative figures for the northern and southern Sudan shown as a percentage of total admissions for the last four years :—

	1934		1935		1936		1937	
	Malignant.	Non Malignant.	Malignant.	Non Malignant.	Malignant.	Non Malignant.	Malignant.	Non Malignant.
NORTHERN SUDAN. Admissions for new growths	145	338	137	328	167	315	161	407
Total admissions ...	57,003		58,445		65,392		66,881	
% of total admissions	0.25	0.59	0.23	0.56	0.25	0.48	0.24	0.60
SOUTHERN SUDAN. Admissions for new growths	21	122	32	156	25	251	16	164
Total admissions ...	28,987		30,638		30,689		34,207	
% of total admissions	0.07	0.42	0.10	0.51	0.08	0.81	0.04	0.45

The incidence by age and sex of the malignant cases was as follows :—

TYPE.	Sex		Age Incidence							
	Male	Female	0-1	1-5	5-15	15-25	25-35	35-45	45-65	Over 65
Carcinoma	50	53	—	1	1	3	15	29	44	10
Sarcoma	32	15	—	2	4	10	16	10	3	2
Unclassified	14	13	1	—	—	2	9	4	11	—
TOTAL	96	81	1	3	5	15	40	43	58	12

UNDULANT FEVER.

33 cases with 1 death were reported in 1937, compared with 58 cases with 4 deaths in 1936, and 28 cases in 1935.

The distribution for the past five years is as follows :—

Province.	1933	1934	1935	1936	1937
Blue Nile	6	17	10	15	10
Darfur	7	7	1	—	2
Equatoria	—	2	2	14	2
Kassala	11	21	12	12	13
Khartoum	1	—	1	5	1
Kordofan	—	—	—	8	2
Northern	—	1	—	1	—
Upper Nile...	—	1	2	3	2
White Nile...	—	2	—	—	1
	25	51	28	58	33

PUBLIC HEALTH AND HYGIENE.

By Mr. H. A. Crouch.

INTRODUCTION.

GENERAL HEALTH.

Beneficial rains gave the country its sixth successive year of good harvests. Grain was plentiful, economic conditions were improved and the population enjoyed a state of reasonable prosperity.

In the absence of any serious epidemic the general health was satisfactory and compared favourably with that of previous years.

Examination of school children in some areas reveals a slight but definite improvement in physique.

In certain provinces, where hospitals have been long established, there has been an appreciable decrease in the number of patients, evidence that preventive medicine is beginning to have its effect and that resistance to endemic disease is on the up-grade. The health of officials indicates that, given reasonable living conditions and personal care, a satisfactory state of health can be maintained.

GENERAL SANITATION.

Sanitary services have been extended and consolidated in most provinces during the year.

There has been a notable improvement in the cleanliness of towns and villages in the northern Sudan. Two factors have contributed, an increase in supervisory staff and the co-operation of the native administration. Local committees for health improvement have been set up in the principal district headquarters and a province board unifies sanitary control and expenditure.

Clearing of insanitary areas and some amelioration of the problem of overcrowding have been achieved in the larger towns. Latrine accommodation has been extended and improved in most areas. Where piped water supplies are available the desirability of installing septic tank systems has been enquired into.

By propaganda and example some improvement has been achieved in the sanitation of villages. Success ultimately depends on the efforts of chiefs and headmen to bring home to the individual householder his responsibility for the cleanliness of his home and its surroundings.

THE PREVENTION OF DISEASE.

The Sudan, by reason of its geographical position, is especially vulnerable to the introduction of epidemic disease from neighbouring countries. The thousands of miles of land frontier, the constant and varied traffic and the many and devious routes, render quarantine control impracticable. Little can be done until the disease has gained a foothold in the country. In 1926 relapsing fever reached the Sudan from the West. The disease had spread across Africa unchecked and for four years the epidemic ravaged the population of Darfur.

Between 1928-1930, 9,000 cases of smallpox occurred in the same province as a result of infection introduced by French immigrants. Cerebrospinal meningitis killed 15,000 of the inhabitants of Kordofan and Darfur Provinces during the years 1934-1936.

Towards the end of 1937 smallpox and relapsing fever were introduced into the eastern provinces by infected labourers returning from Eritrea and Abyssinia. 561,196 vaccinations were carried out and 25,381 persons were deloused but by the end of the year 425 cases of smallpox and 374 cases of relapsing fever had been reported.

Sporadic cases of cerebrospinal meningitis occurred in all provinces but the country was spared the devastating epidemics of the previous three years.

Plague and typhus have not yet been reported in the Sudan. No case of cholera has occurred for many years. Strict anti-plague measures are enforced at Port Sudan ; elsewhere, rat infestation is kept within reasonable limits. The only danger of introduction of cholera is by pilgrims returning from the Hedjaz. Precautionary measures consist of inoculation before departure and a period of quarantine on return.

The sanitary control of aircraft and the elimination of the vector, *Aedes aegypti*, serve to protect the country from the introduction of yellow fever.

As regards endemic disease much has been done where the aetiology is established and control measures are practical.

As a result of anti-mosquito measures, easily accessible treatment and personal prophylaxis, epidemics of malaria no longer occur.

The spread of bilharzia infection has been checked by constant inspection, thorough treatment, and the control of water supplies.

Cases of sleeping sickness have been reduced to a minimum by periodical inspection, segregation and safe settlement of the population.

Following on years of intensive treatment, yaws has practically disappeared from the southern provinces.

With the extension of the School Medical Service and increased facilities for treatment, trachoma, the scourge of the northern Sudan, is effectively dealt with.

A steady improvement in the sanitation of towns has led to a decrease in the incidence of the dysenteries and enteric fever.

The situation as regards tuberculosis, syphilis, hookworm, kala-azar, and filariasis is less satisfactory.

Tuberculous patients rarely attend hospital before the disease is well advanced, when the prospects of cure are hopeless. Many must die in their villages. Little can be done to hinder the spread of infection until the benefits of early treatment are better appreciated.

Syphilis, a mild disease amongst Sudanese, is rarely seen in the primary stage and great difficulty is experienced in persuading patients to complete their cure.

The aetiology of kala-azar and filariasis is obscure. Investigations are proceeding but until more knowledge is available regarding the mode of transmission, reliance must be placed on general measures, calculated to improve conditions of living and increase resistance to infection.

Hookworm, a serious problem in the south, is unlikely to be controlled by curative measures. Prevention postulates the provision of safe latrines and an enlightened population. Progress will be slow, but with the extension of the sanitary organisation recently established at Juba, gradual improvement may be anticipated.

THE CONTROL OF MALARIA.

Malaria is by far the most important endemic disease in the Sudan. Formerly, epidemics of acute malaria swept the northern and central provinces with heavy loss of life. Of recent years, though there have been wide variations in incidence, the disease has not assumed epidemic proportions. During the past year the rains were average and well spaced in the northern Sudan and the malaria rate was low.

Chronic malaria is still very prevalent throughout the country. The splenic index is as high as 70% in some schools.

Generally speaking, anti-mosquito measures are carried out effectively in towns but the close proximity of large and uncontrollable breeding places in the vicinity results in a steady infiltration of adults during the rainy season.

Where control measures are practicable the situation improves year by year. With the recent development of the public health organisation it has been possible in some districts to extend these measures to rural areas. The study of the bionomics and breeding places of the local vector, which is being carried out in the Gezira and in Khartoum, should add to the efficiency and reduce the cost of control measures. It is hoped to extend these investigations to other areas as opportunity arises.

In the south, the heavy rainfall, innumerable rivers, extensive marshes and the immense area make the problem insoluble except in restricted localities. Here malaria is the chief cause of infant mortality but adults acquire a considerable measure of immunity.

The establishment of the dispensary system with its ancillary services of sanitary barbers and tribal dressers has brought treatment within reasonable distance of all. As a result of propaganda and a wider appreciation of the benefits of curative medicine, malaria cases are now treated earlier and more thoroughly than hitherto.

It will be seen from the foregoing that in most areas mosquito control will always be incomplete. Hence protection of the individual, both in urban and rural areas, must be the principal measure of defence. Thorough treatment of the sick, the proofing of dwellings and resthouses, a wider use of the mosquito net, and the routine spraying with insecticide of houses and servants' quarters are the measures by which a lowering of the malaria rate is most likely to be achieved.

In this connection it is satisfactory to note that an efficient and cheap insecticide is now available throughout the country. Its merits have been widely circulated and steps have been taken to encourage its use in every way.

WATER SUPPLIES.

Purification plants and piped water supplies are installed at Khartoum, Khartoum North, Omdurman, Atbara, Port Sudan, Wad Medani, Abu Usher and Juba.

The Egyptian Irrigation Colonies at Malakal, Gebel Aulia, and Gordon's Tree Dockyard are similarly provided for. A purification plant and piped water supply is under construction at Wadi Halfa and plans are under consideration for schemes at Torit and Malakal Town.

Routine examination of established supplies has been carried out during the year with satisfactory results.

In the Gezira Irrigated Area villagers draw their water from neighbouring canals. The practice gives rise to some anxiety as during the " close down " period the water in the minor canals is stagnant and often contaminated with animal and human excreta. Experiments are being carried out with a view to piping canal water to a tank where it can be treated and drawn off by a tap.

AEDES AEGYPTI SURVEY.

This survey has now been extended to all parts of the Sudan. Weekly, and where possible, more frequent inspections have been carried out in towns and all buildings, wells, pools, boats, tree holes and other likely breeding places are examined regularly.

All larvae found are bred out locally and adults forwarded to the Government Entomologist for identification. The total number of inspections made during the year was 4,262,414.

17 adults were captured and 2,886 larval infections found.

Special attention has been paid to the reduction of the Aedes index at Wau and El Obeid. Wau has been a yellow fever infected area and El Obeid is the only airport on the West African route in the Sudan where Aedes are numerous.

The incidence of Aedes, although widespread, is sparse, but occasionally pockets of relatively high incidence occur. The Red Sea Coast, apparently, provides favourable climatic conditions for the propagation of the species and particular attention is now being paid to Port Sudan and Suakin in view of the possible introduction of dengue fever into the ports from abroad.

Holes in trees are probably the most dangerous source of breeding in the southern Sudan. Infections have been found as far as two kilometres from the outskirts of Juba. It is satisfactory to note that this source of infection has been considerably reduced. There were only 11 tree hole infections as compared with 51 last year. 363 trees were filled with cement. None were cut down.

SANITARY CONTROL OF AIRCRAFT.

Inspection and disinsectisation of aircraft on the north to south and east to west routes takes place only at Khartoum, except in cases where aircraft make a night stop at an airport nearer the frontier. On the west to east route these measures are carried out at Geneina and again at Khartoum. All passengers entering the Sudan from the west and those embarking at Malakal must be in possession of certificates stating they have not been exposed to the risk of infection by yellow fever during the previous six days.

During the year the Bahr-el-Ghazal district of Equatoria Province was declared free from infection and air traffic was re-opened.

The following inspections were carried out during the year :—

Khartoum ...	819	Halfa	1011	Geneina	119
Malakal	394	Juba	197		

At Khartoum 6 aircraft were found to be carrying adult mosquitoes. Of these one was an Anopheline imported from Juba, the remainder were Culicine from Asmara. An adult *Aedes aegypti* was found in a machine arriving at Malakal from Juba.

HOUSING.

Satisfactory progress has been made in tackling the difficult problem of native housing. A central committee has been established in Khartoum to consider types of houses which will meet the needs and prejudices of the native population, and at the same time satisfy public health and economic requirements. Due consideration has been given to the employment of locally produced building materials. Plans of all types of houses have been prepared and circulated to the provinces for criticism by British and Native officials. Models are in the course of preparation and demonstration houses will be erected in Khartoum and other province headquarters.

A comprehensive scheme of slum clearance has been initiated in Halfa. The programme is to be spread over three years. The first aim has been the removal of a collection of dilapidated houses and insanitary dwellings from the market area and the provision of alternative sites to the east of the town.

Steady progress has been made on similar areas in other towns of the northern Sudan. Where new lodging areas have been allotted, due attention has been paid to a proper layout with wide streets and the construction of an improved type of dwelling. There is evidence to show that the example set in towns is being followed in some of the principal villages.

In Juba a marked fall in the incidence of malaria amongst northern officials is directly attributable to improved housing.

NUTRITION.

As in the past, few frank cases of dietary deficiency have come to the notice of the medical authorities. Isolated cases of scurvy are occasionally reported and pellagra is said to be prevalent in the Nuba Mountains and among undernourished labourers returning from Eritrea and Abyssinia. All the latter cases cleared up in hospital on a full and varied diet. In the Bari district of Equatoria Province deaths from hookworm have been so prevalent in famine years that local natives firmly believed that poison and withcraft were abroad.

Apart from these cases it has been suggested from time to time that many of the endemic diseases, such as tropical ulcer, pneumonia, hookworm and leprosy are in some way related to malnutrition. In our present state of knowledge of dietetics in the Sudan it is impossible to say to what extent this is the case. According to European standards, deficiencies undoubtedly exist in most native diets, yet evidence of such deficiencies is not apparent. Moreover, in areas where these diseases are endemic it is difficult to account for their prevalence solely as a result of malnutrition. Tropical ulcer is found to be common amongst one section of the Nuer tribe and entirely absent from a neighbouring section living on the same diet and under precisely the same conditions. Again, it has been suggested that because of the milk drinking propensities of the Arab pastoral tribes they are less susceptible to leprosy than the agriculturists of the south. Yet the Bunyoni of Ruanda who are pastoralists and herdsmen appear to be quite as susceptible and possibly less resistant to the disease.

As a preliminary to a closer study of the problem it is essential that a fuller and more exact knowledge of diets in all areas be obtained. From an analysis of endemic diseases prevalent in these areas over a number of years it may then be possible to correlate certain diseases with such deficiencies as are found to exist. It is intended to proceed on these lines in the coming year.

HEALTH ORGANISATION

Public health work in Khartoum Province which includes the towns of Khartoum, Khartoum North and Omdurman is under the control of the Medical Officer of Health, Khartoum. In addition to his public health duties, this official is in charge of Khartoum North Civil Hospital, the Central Prison and 13 province dispensaries. With the part time assistance of a medical officer he is responsible for the inspection and treatment of school children in the area.

The population of the Three Towns is estimated at 173,980, that of the rest of the Province at 80,071.

In the other provinces the Medical Officer of Health is the Senior Medical Inspector of the Province. In these provinces where staff is limited, it is necessary, in order to ensure economy of effort and the maximum efficiency in the use of personnel, that the administration both of preventive and curative medical work should be combined under a single head. This is not only the case in the less developed provinces, but is felt to be even more important in a thickly populated district such as the Gezira Irrigated Area. The Senior Medical Inspector is assisted by one or more British sanitary inspectors or Sudanese sanitary officers.

BRITISH SANITARY INSPECTORS.

The Chief Sanitary Inspector retired to pension during the year. The cadre is thus reduced to 12 whose distribution is as follows :—

Khartoum	2	Port Sudan	1
Omdurman	2	Northern Province	2
Blue Nile Province	4	Juba	1

The duties of the British sanitary inspectors have now become largely supervisory and educational, and the bulk of the routine sanitary work, such as the control of mosquito breeding, devolves upon Sudanese staff. Seeing that during the leave season this cadre is reduced by half and that the public health work of the country is increasing yearly, it is apparent that any further reduction in British staff is at present inadvisable.

QUARANTINE MEDICAL OFFICERS.

Quarantine work at Port Sudan is in charge of a medical officer working under the supervision of the Senior Medical Inspector. Port sanitation is carried out by a British sanitary inspector who has had special training in this branch of the service.

A medical inspector and a medical officer are posted at Suakin during the pilgrim season ; an assistant medical officer is in permanent residence.

Wadi Halfa quarantine, which controls the importation of labour from Egypt, is under the supervision of the Senior Medical Inspector, assisted by a medical officer.

SUDANESE SANITARY OFFICERS.

Two candidates passed the examination of the Royal Sanitary Institute in November and were posted to provinces.

Eight sanitary officers have passed the examination since its institution in 1934. Their distribution is as follows :—

Blue Nile Province	2
Kordofan Province	1
Omdurman	1
Northern Province	1
Upper Nile Province	1
Kassala Province	1
Darfur Province	1

A sanitary officer is now posted to all provinces where British staff is not available.

SANITARY OVERSEERS.

Sanitary overseers are junior qualified Sudanese officials who are directly responsible for carrying out the routine sanitary work of the provinces. In the larger towns they work under supervision of British sanitary inspectors or Sudanese sanitary officers ; elsewhere they function independently. In all cases they are in charge of unqualified staff and working parties and, in carrying out their duties, come in close contact with administrative officials and the native population. Thus they are provided with unique opportunities of spreading public health propaganda and of stimulating the sanitary conscience of the people. On first appointment their activities are often unpopular and their presence is resented. It is essential therefore that this cadre be recruited from youths of exemplary character, of a good standard of education, and possessed of tact and a sense of responsibility.

In 1935, arrangements were made for candidates to undergo a course of instruction in Khartoum and pass a qualifying examination. It was estimated that an establishment of 70 posts were required to meet the immediate public health needs of the country. 51 of these posts have been filled and with few exceptions, those appointed have proved an unqualified success.

Of the remaining posts, 12 are required for work in the southern Sudan and for these it is essential that the personnel be recruited locally. To this end, a training class for southern sanitary overseers was instituted at Juba early in the year. Its purpose is to provide in all district headquarters a trained man capable of supervising the essential sanitary arrangements and of reporting on and carrying out such improvements as may be necessary. The course of training lasts one year and consists of lectures and demonstrations in practical sanitation. The lectures are given in English by the British Sanitary Inspector in charge. Successful candidates will be posted to districts whence they are recruited.

DISPENSARY STAFF.

A course of public health instruction is included in the syllabus of training for assistant medical officers. In outlying districts where no sanitary staff is available the Assistant Medical Officer is responsible for public health work in his area.

THE HEALTH AND SANITATION OF PROVINCES.

KHARTOUM PROVINCE

Area—5,700 square miles. Population 255,166.

General.

The early months of the year were cold and pneumonia was more prevalent than usual. Chickenpox and mumps spread throughout the province during the first quarter and then slowly died out.

Malaria, which had shown an increased incidence towards the end of 1936, did not fall to normal proportions in the Rural District until June.

The rainfall in Khartoum was light and the Nile was of good average height.

Vital Statistics.

Population.

The figures presented below are of little intrinsic value, but generally they can fairly be compared with those of other years.

The following table gives the estimated population of the four districts for the years 1936 and 1937 :—

		Men.	Women.	Children.	Total.
Khartoum	1937	15,826	13,589	15,095	44,510
	1936	15,617	13,063	14,306	42,986
Khartoum North	1937	4,780	4,522	5,711	15,013
	1936	6,906	7,532	9,003	23,441
Omdurman	1937	27,851	36,892	49,714	114,457
	1936	27,921	36,741	48,198	112,860
Rural District	1937	20,276	26,877	34,033	81,186
	1936	22,786	26,883	34,227	83,896
For the whole Province ...	1937	68,733	81,880	104,553	255,166
	1936	73,230	84,219	105,734	263,183

It will be seen that there is an appreciable decrease in the population of Khartoum North. This year a careful house to house count was made and it appears that previous estimates were too liberal.

The fall in the male population in the Rural District is probably accounted for by the removal of labour from Jebel Aulia on completion of the Dam.

The following table shows the population by race :—

British	763	Egyptians and Syrians	5,649
Greek	1,699	Sudanese	244,669
Other Europeans ...	960	All others	1,426

The Sudanese population of the province is less by 13,118 and that of foreigners by 1,218 as compared with the 1936 estimates.

The following figures are not included in the tables above :—

Average strength	...British Troops	1,226
	...Sudan Defence Force	789
	...Central Prison	384

The population of the province is largely urban for 68.5% live in the Three Towns whilst the remaining 31.5% live scattered throughout the province but mostly on the rivers.

In England and Wales 80% of the population live in urban areas.

Density.

The following table shows the number of persons per acre :—

PLACE.	Area in Acres.	Population	Density
Khartoum	1,424	17,742	12.5
Khartoum Native Lodging Area	312	22,972	73.6
Burri Villages	119	3,796	3.2
Omdurman	1,828	114,457	62.6
Khartoum North	549	10,196	18.6
Khartoum North Native Lodging Area ...	157	3,604	24.0
Hillet Hamad	70	3,564	50.4

The province holds about 44.6 persons per square mile. In England and Wales there are 68.5 persons per square mile.

Number of persons per acre–England and Wales :—

England & Wales	1.1	All County Boroughs	17.5
All Urban Areas	7.1	London Administrative County	58.7
		Greater London	18.5

Houses in England are usually of two or more storeys. It will readily be seen how overcrowded are the Khartoum Native Lodging Area, Omdurman and Hillet Hamad.

The population of Omdurman is likely to continue to increase and it is desirable that further subdivision of plots be prohibited and that further building should be on new land and not on the present built-up area.

Compounds in the Native Lodging Areas should be enlarged as soon as practicable.

Births and Deaths.

The registered births were 4,274 or 51 more than in 1936 and deaths 2,454 or 196 fewer than in 1936. The excess of births over deaths was 1,820 giving a natural increase rate of 7.2 per 1,000 as compared with a rate of 3.3 in 1932 and 15.4 in 1876 in England and Wales.

In the following tables births are live births only :—

	Male	Female	Total	Birth rate
British	4	1	5	6.5
Greek	9	9	18	10.7
Other Europeans	5	8	13	13.5
Egyptian and Syrians	94	105	199	35.8
Sudanese	2,058	1,934	3,992	16.4
All others	22	25	47	34.2

The birth rate for Khartoum Province in 1937 was 16.8.

The rate for England and Wales in 1870–1880 was 35.4 and 14.8 in 1936.

The still-birth rate was as follows :—

Khartoum	17.8	Omdurman	28.6
Khartoum North ...	29	Rural District	22

These rates are very low (that for England and Wales is about 40) and probably many still-births are not registered.

Deaths by Localities and Sexes :—

	Male	Female	Totals	Death Rate
Khartoum	313	244	557	12.5
Khartoum North	118	182	300	19.5
Omdurman	534	659	1,193	10.4
Rural District	185	219	404	5.0
For the whole Province	1,150	1,304	2,454	9.7

The death rate in England and Wales in 1936 was 12.1 whilst in 1870-1880 it was 21.4.

Seasonal Death Rate.

Figures suggest that, in the absence of epidemics, especially meningitis, the dry hot months of March, April and May are " healthy " whilst the cold months —if associated with pneumonia—show a higher number of deaths.

Deaths by age Periods.

	0-1	1-5	5-10	10-20	20-40	40-60	Over 60
Deaths	345	380	57	81	376	294	921
Percentage 1937	14.1	15.5	2.3	3.3	15.3	12	37.5
Percentage England and Wales, 1936	7.1	2.5	1.2	2.1	8.0	19.2	59.9

Without being able to standardize the population of Khartoum, these figures are not, of course, comparable ; nevertheless they show that a higher percentage of deaths occur in early life and suggest that the calculated death rate of Khartoum is lower than the actual death rate.

The vital statistics emphasize the need for proper census taking. The births and deaths are fairly accurately registered in the Three Towns and the infant mortality rate is found to be much the same in Khartoum North and Omdurman (102 and 94.1), two towns of a mixed " native " population. It is then curious to find that the birth rates (33.9 and 17) and death rates (19.5 and 10.4) should differ so in these two towns. As the births and deaths can be taken as fairly accurate one must presume the population figures are inaccurate. The higher birth and death rates of Khartoum North present a picture more in keeping with what might be expected of such a town in its present stage of development.

Until population figures can be more accurately estimated, these vital statistics can be of only slight value as a mere year to year comparison.

Analysis of the Causes of Death.

In the majority of the deaths registered the cause of death is certified by a native official who has had but the most elementary medical education.

The following table shows the causes of death certified by medical practitioners only :—

1.	Pneumonia	132
2.	Heart Disease	98
3.	Dysenteries and Diarrhoea	65
4.	Tuberculosis (mostly pulmonary)	40
5.	Violence	39
6.	Kidney Disease	34
7.	Septic Conditions	29
8.	Malignant Disease	25
9.	Old Age	23
10.	Cerebral Haemorrhage	16
11.	Malaria	14
12.	Typhoid	11
	Difficult Labour and Disease of Pregnancy	11
13.	Meningitis (Cerebrospinal and Pneumococcal)	10
14.	Dropsy	9
15.	Diabetes	8
16.	Intestinal Obstruction	7
17.	Jaundice	5
	Kala-azar	5
18.	Diphtheria	4
	Appendicitis	4
19.	Tetanus	3
20.	Asthma	1
	Relapsing Fever	1
	Smallpox	1
	TOTAL	595

It will be seen that nearly one quarter of the deaths are certified as being due to pneumonia.

It is of some interest to compare this list with the five principal certified causes of death in England and Wales in 1936.

1. Diseases of the Heart and Circulatory System.
2. Malignant Disease.
3. Bronchitis and Pneumonia.
4. Diseases of the Nervous System.
5. All forms of Tuberculosis.

Nervous disease is absent from the Khartoum list but cerebral haemorrhage is commonly included in the nervous disease group in England and Wales.

COMMUNICABLE DISEASES.

There was a great increase in the number of cases of amoebic dysentery reported from the Rural District where, however, the diagnosis is made by subordinate staff without microscopic examination.

Cases of enteric fever notified were 78 as compared with 76 in 1936.

Locally contracted malaria cases were down to 149.

Mumps persisted throughout the year, 1054 cases being reported.

Chickenpox was prevalent in the early part of the year but died out about September.

There was a slight increase in the number of notified cases of tuberculosis.

Three imported cases of relapsing fever were seen and two of smallpox whilst one was locally contracted.

There were a few sporadic cases of cerebrospinal meningitis.

COMMUNICABLE DISEASES

SHOWING NUMBER OF CASES NOTIFIED AND PLACE.

Disease	Khartoum Local Cases	Khartoum North Local Cases	Omdurman Local Cases	Total of Local Cases	Rural Dist. Cases	Imported Cases	Relapsed Cases	Grand Total
Chickenpox	38	3	85	126	172	6	—	304
Diphtheria	5	8	6	19	1	3	—	23
Meningitis, Acute	—	—	—	—	—	2	—	2
Meningitis, Cerebro-spinal	—	3	4	7	3	—	—	10
Relapsing Fever	—	—	—	—	—	3	—	3
Smallpox	—	—	—	—	1	2	—	3
Ankylostoma	—	—	—	—	2	—	—	2
Bilharzia	2	1	—	3	26	38	—	67
Amoebic Dysentery	9	6	96	111	765	18	45	939
Bacillary ,,	14	—	2	16	10	1	—	27
Enteric Fever	9	11	49	69	2	7	—	78
Canine Rabies	—	—	2	2	4	1	—	7
Kala-Azar	—	—	—	—	—	6	—	6
Leprosy	1	—	6	7	3	9	—	19
Malaria	89	24	36	149	3,076	196	233	3,654
Measles	1	1	—	2	8	1	—	11
Mumps	74	114	241	429	621	4	—	1,054
Puerperal Fever	—	—	1	1	—	—	—	1
Soft Sore	—	—	1	1	13	—	—	14
Syphilis	—	24	23	47	737	16	—	800
Sleeping Sickness	—	—	—	—	—	1	—	1
Pulmonary Tuberculosis	11	7	31	49	6	47	—	102
Non-Pulmonary Tuberculosis	6	—	33	39	6	28	—	73
Whooping Cough	7	7	46	60	224	—	—	284

Relapsing Fever.

Three cases were found. All were imported.

The first case fell sick in the native lodging area. House to house visiting did not bring to light another case. About the same time "Westerners" were returning from Italian territory via Kassala and Khartoum to the Blue Nile Province.

518 were deloused and their clothing and bedding sterilized. Some 300 blood films were examined to determine whether there were a carrier state. Only one slide was positive, that being a of youth with active disease.

Smallpox.

Three cases were notified. Two were imported.

The usual measures were undertaken and altogether 56,297 vaccinations were made during the year.

Chickenpox.

Altogether 304 cases were notified. The disease is in itself of little importance but may closely resemble mild smallpox.

Diphtheria.

There was some increase in the number of cases notified—23 as compared with 13 in 1936. Three were imported cases from Egypt.

The disease is rare but severe and rapid in its course, patients commonly being presented at hospital when treatment is hopeless. Several carriers of virulent organisms were found among the close contacts of cases. Diphtheria seems to occur more frequently among foreigners in the Sudan, only nine cases being amongst Sudanese. As in temperate climates it is a disease of childhood and 18 of the 23 cases were children under 15 years of age.

Whooping Cough.

284 cases were notified. Fortunately this distressing disease is generally mild in the Sudan, is seldom complicated and is of no special importance.

Measles.

Eleven cases were reported. The disease is of little importance and is seldom or never followed by the severe complications seen in temperate climates.

Meningitis.

Twelve sporadic cases were reported.

Mumps.

Mumps was prevalent throughout the year. 1,054 cases were notified.

There were 63 cases in the Central Prison ; about a quarter of the cases was complicated by orchitis which, however, was never bilateral.

Dysenteries.

Amoebic Dysentery. 939 cases of amoebic dysentery were notified as compared with 434 in 936. The increase is due to the large number reported from the Rural District.

The Three Towns notified 111 cases of which 96 came from Omdurman. There is no doubt that amoebic dysentery is more common in Omdurman than in the two Khartoums. The incidence rises in late summer and autumn when there is a higher relative humidity and a greater number of flies.

The age incidence seems to fall most heavily on young adults, whilst Europeans and foreigners are seldom attacked.

Cases by Race :—

Greek	1
Egyptians and Syrians	3
Sudanese	107

Cases by Age :—

Age Periods.	1-5	5-15	15-25	25-35	35-45	45-55	55-65	Unknown
Cases	17	14	28	36	8	4	3	1

Bacillary Dysentery.

In 1937 there were 27 cases notified.

This disease is much more commonly reported among the British than any other race. Possibly it is a milder disease among the Sudanese or perhaps most Sudanese, having suffered from bacillary dysentery in childhood, are more resistant in adult life. Diarrhoea is a common cause of death among the natives who speak of a " diarrhoea of children."

Cases by Race :—

British	14
Syrian	1
Indian	1
Sudanese	11

Cases by Age :—

Age Periods.	1-5	5-15	15-25	25-35	35-45	Unknown
Cases	1	1	7	4	1	13

Causal Organism :—

B. Flexner	14
B. Shiga	1
B. Schmitz	1

11 cases were clinical.

Eight of the cases occurred among the British troops.

18 cases of diarrhoea were seen in the Central Prison from which a Flexner organism was isolated in one case and a Shiga in another.

Enteric Fever.

There were 78 cases notified as compared with 76 in 1936.

There was some change in the distribution of the cases among the Three Towns. Thus in Khartoum there were 9 cases, in Khartoum North 11, and in Omdurman 49, where there had heen 19, 2 and 46 respectively the year before. There were 7 imported cases.

Except that the cases in Khartoum North all occurred during the last three months of the year, generally, there was no special seasonal incidence.

No common source of infection has been found so far. The town water supplies can fairly be held to be " safe." The large number of wells and of milk sellers in Omdurman and Khartoum North prohibit the examination of these sources of infection.

The cases are seen most commonly among children and young adults.

Cases by Race :—

British (soldier)	1	(Clinical.)
Egyptians	3	
Abyssinian	1	
Sudanese	73	

Cases by Age :—

Age Periods.	1-5	5-15	15-25	25-35	35-45	Unknown.
Cases	13	39	20	4	1	1

Type of Organism :—

B. Paratyphosus " A "	3
B. Typhosus	74
Clinical	1

Malaria.

There were 3,654 cases as compared with 3,374 in 1936. Many cases are not reported and there can be no doubt that malaria is at present by far the most important endemic disease of the province.

There were 89 primary cases reported in Khartoum, 24 in Khartoum North and 36 in Omdurman as compared with 100, 34 and 80 respectively in 1936.

The rainfall was light and the Nile of good average height.

In Khartoum, towards the end of the year, a sample of ordinary natives at work was examined and among them 10% were found to be carrying malarial parasites. There is little doubt therefore that a reservoir of infection is constantly present in Khartoum during the malarial season ; the prevailing north wind inevitably carries a few adult mosquitoes into the town and, although actual mosquito breeding is controlled, primary cases of malaria will occur until the destruction of adult mosquitoes becomes a general habit among the householders.

A mosquito survey was begun in Khartoum ; its main object was to find, if possible, the source of the chief vector of the disease. Two small outpatient stations were opened where it is hoped to be able to treat cases of malaria among the local people who live too far away from hospitals.

It was found that many sailors reported sick with malaria on arrival in Khartoum North. Prophylactic treatment is given to the crews of steamers coming from the south during the last week of the journey and cases of malaria are treated in a mosquito proof ward in the Khartoum North hospital.

Primary Cases by Race :—

1. British	55
2. Greek	6
3. Italian	1
4. Armenian	3
5. Syrian	5
6. Russian	1
7. Sudanese	78

Type of Parasite :—

1. Malignant tertian	104
2. Benign tertian	31
3. Mixed M.T. & B.T.	1
4. Quartan	1
5. Clinical	12

Cases amongst British Troops.

Among British troops there were 42 primary locally contracted cases, 11 cases from the Rural District, 12 imported and 5 relapses as compared with 80, 6, 14 and 15 respectively in 1936.

Mosquito Control.

This was carried out as in past years. Breeding is effectively controlled in Khartoum but adult mosquitoes are carried into the town on the prevailing wind and towards the end of the year give rise to cases of malaria. Householders must learn to spray their houses to destroy these adults. There is still too much undergrowth of all sorts in gardens, which provides a haven of rest and shelter for mosquitoes.

Breeding was profuse throughout the Rural District in November and December but seemed to die down during the hot, dry months of spring.

The cost of anti-mosquito work was £E. 4,388, labour costing £E. 2,995 and larvicides £E. 1,393.

The number of infections found was 19,961 of which 1,738 were in Khartoum District, 1,013 in Omdurman, 1,201 in Khartoum North, 7,009 in the Rural District.

Trains and aircraft were inspected and sprayed. The former carried mosquitoes during the rains and up to the end of November.

Rabies.

This disease must now be considered endemic. Areas can at times be declared free but are always open to re-infection. Seven cases of canine rabies were confirmed microscopically—one case being imported. No case of hydrophobia was seen.

Bilharzia.

67 cases were reported of which 38 were imported whilst 26 occurred in the Rural District and 3 in the Three Towns.

Syphilis.

800 cases were reported, 47 being local. Notification is, of course, not complete.

Pregnant women attending Omdurman Hospital during the last four years have shown about 10% positive blood tests although it is rare to see frank cases of congenital syphilis.

Leprosy.

There were 19 cases notified.

As in previous years the cases are mostly males. " Relative segregation " is attempted for those cases in whom the disease is still active.

During the last 8 years 133 lepers have been notified. Of these, 61 were local cases, 72 imported. 13 have died, 38 are under treatment, 82 have returned home or been lost sight of.

Tuberculosis.

175 cases of tuberculosis were notified in 1937 of which 102 were pulmonary, compared with 143 and 95 respectively in 1936.

Although these numbers are not large yet tuberculosis comes fourth on the list of killing diseases certified by medical practitioners. These deaths occurred mostly in hospital and, tuberculosis being generally a chronic disease, will send most of its victims to hospital.

Tuberculous patients and more particularly those with phthisis usually die of their disease. In 1930, 82 cases of pulmonary tuberculosis were notified ; of these 29 left the district and 4 cannot be traced. There remain 49 cases whose fate is known. There are but three living now.

It may be concluded, then, that in few patients—even if discharged from hospital with a negative sputum—does the disease long remain quiescent. Most patients are therefore a source of infection and little good except to the individual can be done by hospital treatment alone since, in prolonging life, the source of infection is maintained.

Contacts of cases are a special sample of the people and careful, repeated examinations making free use of X-ray films have shown a high rate of infections among them in other lands.

Further the prognosis depends almost entirely upon the stage of the disease when treatment is started. The all important point is early diagnosis and often this can best be secured by examination of contacts. To examine the contacts of some 80 cases twice or thrice a year for four or five years needs the services of a doctor who can set aside a good deal of his time for this work alone.

Again generally speaking, tuberculosis is a disease of the poor and, on discharge from hospital, many need help in the form of food, clothing, etc.

There is, of course, as yet nothing in the Sudan that can be compared with a modern sanatorium.

Cases by Sex :—

	Pulmonary.	Non-pulmonary.
Male	85	45
Female	17	28

Cases by Age :—

Age periods Cases.	5-15	15-25	25-35	35-45	45-55	55-65	Over 65	Unknown
Pulmonary	2	24	46	16	6	5	2	1
Non-Pulmonary ...	14	18	21	10	7	3	—	—

Cases by Occupation :—

OCCUPATION.	Pulmonary.	Non-pulmonary.
Shopkeepers and Artisans	21	4
House servants	5	2
Labourers	3	2
Clerks	6	1
Cultivators	15	12
Soldiers, Police, Orderlies	3	—
Car drivers	5	1
Hospital attendants	1	—
Others	5	4
Indigent, unemployed	21	15
Women	16	16
Children under 15 years	1	16

The following table shows the disposal of cases notified during the year :—

	Pulmonary	Non-pulmonary.	Total.
Died	31	13	44
Left the Province	25	15	40
Still in hospital	9	4	13
Still in Province	18	20	38
Untraced	19	20	39
	102	72	174

The following table shows the result of a follow-up of 629 cases of pulmonary tuberculosis notified from 1930 to 1936 :—

YEAR	No. of Cases	Died	Condition in December, 1937			Total
			Left District	Alive in District	Untraced	
1930	82	47	28	3	4	82
1931	69	37	23	2	7	69
1932	96	59	25	7	5	96
1933	100	58	30	9	3	100
1934	83	45	29	5	4	83
1935	104	44	28	28	4	104
1936	95	36	19	22	18	95
TOTAL ...	629	326	182	76	45	629

The following table shows the result of a follow-up of 279 cases of non-pulmonary tuberculosis notified from 1932 to 1936 :—

YEAR	No. of Cases	Died	Condition in December, 1937			Total
			Left District	Alive in District	Untraced	
1932	36	9	11	12	4	36
1933	76	18	19	28	11	76
1934	58	17	19	16	6	58
1935	61	14	14	31	2	61
1936	48	11	7	22	8	48
TOTAL ...	279	69	70	109	31	279

Khartoum North Central Prison.

The average daily strength of prisoners was 384. This figure does not include some 20 lunatics.

The health of prisoners was good. 127 were treated as inpatients together with 47 from the province prison.

Mumps was for a time troublesome and altogether there were 63 cases, the month of September providing the greatest number. Orchitis was a complication in about one quarter of the cases.

There were 18 cases of dysentery and diarrhoea, 9 cases being seen in August and September. One case proved to be a Flexner infection, another a Shiga and the remainder were " clinical."

Two cases of enteric fever occurred at the same time. The patients had been inoculated in 1934 and 1936 respectively.

Every prisoner who had not been inoculated within the last year was given two doses of the vaccine as a prophylactic measures.

No cases of deficiency disease was seen.

There were two cases of tuberculosis—one pulmonary and the other of bone.

No case of gonorrhoea was detected. 11 cases of syphilis were treated.

There was one death due to malignant disease.

The " juvenile " prisoners are in a compound of their own. A few cases of mumps occurred among them.

The prison diet seems to be adequate and prisoners generally present a picture of physical well-being.

The lunatics are well cared for and, although generally admitted as dangerous and incurable, it has been possible to discharge one or two from time to time.

Examination of School Children.

During 1937, 33 schools were inspected and 5,601 children examined as compared with 19 and 2,814 respectively in 1936.

A few improvements were made in buildings but some of the schools are still somewhat overcrowded, whilst in others structural alterations would be desirable.

Only one girls' school was visited and, although this school work was greatly increased compared with other years, yet there are still many more boys' schools that should be inspected.

To examine, to supervise the treatment of defects found and to re-examine on completion of treatment the boys and girls of town and village schools needs at the very least the full time services of one medical officer.

The following tables show a summary of the results of school medical inspection during the past three years :—

	1935	%	1936	%	1937	%
Number examined	2,460		2,814		5,601	
Trachoma	1,120	45.5	1,055	37.5	2,074	37
Defective vision	245		233		245	4
Dental	245	9.96	267	9.49	559	10
Albuminuria	43		160		332	6
Splenomegaly	13		53		152	2.7
Diseases of ear, nose and throat	32		64		167	3
Cardiac defects	30		26		22	
Pulmonary disease (non tuberculous)	3		9		5	
Physical defects	33		21		18	
Skin disease	—		24		7	
Other conditions	29		8		37	

It will be seen that the percentage of active trachoma is about the same as last year. This year many new schools were examined where there had been no systematic treatment of trachoma and it would be reasonable to expect to find a higher percentage of active trachoma in such schools. This would raise, of course, the percentage found in the schools as a whole.

METEOROLOGICAL OBSERVATIONS
AT
STACK MEDICAL RESEARCH LABORATORIES, KHARTOUM.
1937.

Month.	Temperature in Degrees Fahrenheit			Mean Relative Humidity % at 8 a.m.	Average Evaporation in m. m.	Rain in m.m.	Dust and sand storms	Prevailing Winds
	Mean Temp.	Mean Max. Temp.	Mean Min. Temp.					
January	68.6	87.8	54.2	40	7.9	—	1	N.—NW.
February	75.6	93.8	62.6	26	9.1	—	0	N.
March	79.4	99.4	63.4	25	10.3	—	3	N.—NW.
April	86.6	105.2	71.0	23	11.8	20.6	3	N.
May	90.2	106.2	76.6	36	12.0	7.6	5	N.
June	91.4	107.4	78.6	34	13.2	6.4	7	S.
July	86.9	100.0	77.5	63	10.6	52.2	10	SSW.
August	84.8	96.0	75.8	63	8.8	23.5	6	S.
September	88.0	102.4	77.6	57	10.7	5.1	7	S.
October	89.4	104.7	77.9	40	10.7	2.1	4	N.
November	79.7	97.7	66.7	33	9.3	—	0	NNW.—N
December	77.2	94.0	64.2	46	8.0	—	0	N.

NORTHERN PROVINCE.

Area 236,200 square miles. Population 571,330.

The general health of this province compared very favourably with that of previous years. No major epidemic occurred. Cerebrospinal meningitis which was prevalent last year diminished in incidence and mortality. 104 cases of pneumonia with 69 deaths occurred during the cold weather in the Merowe district.

Conjunctivitis, trachoma, schistosomiasis, syphilis, chronic malaria and tuberculosis provide the bulk of cases attending hospitals and dispensaries.

The incidence of malaria showed a slight increase in the southern districts. Elsewhere there were far fewer cases.

Enteric fever has been endemic in Dongola district for a number of years and the carrier rate is probably high. There was a further reduction of cases in Dongola town but a sharp outbreak of 32 cases occurred in Merowe. Taking into consideration the unfavourable climatic conditions and the prevalence of flies the incidence of other intestinal disease is not high.

The situation as regards pulmonary tuberculosis causes some anxiety. In Halfa 55 cases were diagnosed, 29 of whom were in women who had never left the district. The majority of cases occur in servants who have contracted infection in Egypt and who return home in an advanced stage of the disease. The treatment in these cases is unsatisfactory and after a preliminary stay in hospital for rest and education they return to their villages with instructions as to future care of themselves and neighbours. Notwithstanding these precautions it is obvious that such cases constitute a serious menace to those with whom they come in contact.

It will be seem from the above that the bulk of the sickness in this province is caused by preventable disease. Remedy lies in improved sanitation and better conditions of living. It is satisfactory to note that steady and progressive improvement has been made during this year in this direction. Sanitary services have been augmented, town and village sanitation improved, and mosquito control extended in all districts.

BLUE NILE PROVINCE.

Area 43,800 square miles. Population 760,224.

The health of the province was good. There was a decrease in in-patients and a small increase in out-patients. Preventive medicine slowly shows good results and it is anticipated that there will be a further decrease in in-patients in 1938.

There was a great reduction in the incidence of malaria. Rains were well spaced and many natural depressions either did not fill or held water which dried up early.

As a result of propaganda, the use of insecticide in private houses was more general and it is hoped that this practice will become a daily routine habit. Once the practice is firmly established, the sickness rate will show a decline.

Precautions in the Gezira area for the control of mosquito breeding have been continued on the lines described in previous reports.

The large number of natural depressions which exist in this area are a constant source of trouble and danger during the rains. In the past many tons of oil have been used in these areas but when overgrown with weeds, oiling is not satisfactory. This year for the first time these areas were treated with Paris green. It was hoped to give this method a thorough test, but the exceptionally low rainfall in September was not sufficient to fill the depressions. Nevertheless the results obtained were highly satisfactory and the same method is to be adopted in 1938. Experience has shown that dusting should be done every 7 days. Apart from its efficiency and the speed with which large areas can be treated, there is a great saving in cost as compared with oil.

Similar experiments have been carried out at the Gezira Research Farm and on a neighbouring cotton area. The results were very good. Last year it was an easy matter to find many infections of anopheline larvae at the weekly inspections. After the introduction of this method infections were difficult to find. The danger of poisoning from Paris green is small. Arsenic is present in small dilution but no ill effects have been seen. Lucerne has been treated over a long period and used as fodder for cows. Poultry have been thriving in the Paris green area, although their food and water have been heavily dusted. Irrigation channels near villages were treated and have undoubtedly been used for drinking purposes by the villagers with no ill effect.

Smallpox and relapsing fever were reported towards the end of the year. Both these diseases were introduced by immigrant labour from Abyssinia. From September to the end of December, 29 cases of smallpox with 4 deaths were admitted. The majority of these cases were in Abyssinians. A vigorous vaccination campaign was instituted and a total of 185,000 vaccinations were carried out. The campaign is being continued.

The situation in regard to bilharzia shows no cause for alarm. Whilst the percentage figure for Blue Nile children shows an increase *i.e.*, .62% compared with .31% the rise can be attributed in some measure to the number examined viz about 100% more than last year. As has been pointed out in previous reports the solution of the bilharzia problem is a safe water supply, preferably from deep wells or piped from canals. Both methods are being followed and only lack of funds prevents further extension. Unless these measures are adopted on a wide scale, the numbers of infected Blue Nile natives will probably show an increase. Large numbers of foreign labourers temporarily resident in the province are infected. Their ideas of sanitation are very crude, and bearing in mind the fact the practically all canals contain Bullinus and Planorbis snails, it would appear to be inevitable that the snail infection will increase.

It is satisfactory to note a further fall in the cases of dysentery.

The following table shows the figures for the last six years :—

1932	185	1935	93
1933	168	1936	62
1934	131	1937	52

In the Fung District a further increase in the number of cases of kala-azar was reported. The area involved appears to have extended north.

KASSALA PROVINCE.

Area 134,450 square miles. Population 419,857.

A feature of the medical work in this province during the past year has been the treatment and control of labourers returning to the Sudan from Eritrea and Abyssinia.

In addition to a large number of ulcers and other minor conditions, 97 cases of relapsing fever with 7 deaths, and 52 cases of smallpox with 9 deaths occurred in returning labourers. All these cases were infected in Italian territory.

Delousing and vaccination centres were established at Kassala and Gedaref hospitals and at a number of points on the border. Immigrants were rounded up deloused and vaccinated. Check examinations were carried out at Kassala, Gedaref and Sennar railway stations, and on lorries proceeding by road. By the end of December, 21,864 persons had been deloused and 65,806 vaccinated. These measures, promptly and efficiently carried out, were largely instrumental in preventing the occurrence of widespread infection in the neighbouring thickly populated area of the Gezira.

Port Sudan—Population 20,772.

Taking into consideration the unfavourable climatic conditions, the varied and changing population, and the risk of imported infection, the health of the Port and district can be regarded as satisfactory. With the exception of a few cases of chickenpox and mumps there was no serious outbreak of epidemic disease.

Fly borne infections are prevalent, especially during the warm months after rain. 169 cases of dysentery were admitted to hospital, of these 77 cases were amoebic, 92 bacillary. There were five cases of enteric fever with three deaths. Three of these were natives of Port Sudan, two were imported cases.

A comparatively high incidence of tuberculosis is associated, similarly, with the warm humid conditions of the coastal belt. 40 cases of pulmonary and 41 cases of non-pulmonary tuberculosis came under treatment.

Although Port Sudan, in common with the rest of the Red Sea Littoral, has been regarded hitherto as non-malarious, seven primary cases were reported during the year.

The limitation of fly breeding and the disposal of sewage are the two most important sanitary problems of the district.

Anti-fly measures. The incidence of flies and the resultant diseases, enteritis and dysentery, are higher than in most other towns of the Sudan. The continuous humid warm atmosphere is very favourable to breeding and strict control has to be exercised by the public health staff. Particular attention is paid to the treatment of fly infections with sulphate of iron, cleanliness and improved construction of native latrines, weekly house to house inspections to ensure cleanliness of compounds and adequate disposal of dry rubbish and waste water.

Sewage disposal. Port Sudan, built on coral, is served partly by a water carriage system with septic tank or cesspool connections and partly by a bucket system.

Experience has shown that septic tanks installed some 12 years ago are still working satisfactorily and have not required any attention. There are now 135 water closets in Port Sudan, 66 of these have septic tanks, 69 cesspool connections. Cesspools have given some trouble, and from time to time have had to be emptied by the exhauster. Seeing that the subsoil water is brackish and consequently wells are not used, there seems no reason why the septic tank system should not be extended, always provided the water supply is equal to the demand and adequate space is available. 2,149 buckets are in use. Sewage is discharged partly into the sea, partly into shallow trenches.

Anti-mosquito work. The prevalent infection is *Aedes aegypti*. These infections occur mostly in the native lodging areas. Recently, weekly inspections have been instituted and it is hoped that by this means the incidence will be reduced. Culex and anopheline infections are also found, particularly in the native garden area where fresh water is found near the surface.

Rat Control. The number of rats caught in 1937 were some 300 per month above the the number caught in previous years. This is due to the increase in the number of traps used. Still more traps are required.

Every endeavour is made to rat-proof premises. The warehouses are now being made with partial concrete walls or coralline walls with a skirting of concrete. Galvanised iron walls were found to be inefficient owing to the bulging caused by heavy bales falling from a height. All ships are required to fit rat guards to their hawsers.

Native craft are a danger in that it is easy for a rat to jump from a boat to the quay. It is proposed therefore to remove the harbour for native craft to a bay close by.

The total number of rats caught during the past five years is as follows :—

1933	1934	1935	1936	1937
6,454	6,705	6,134	5,302	8,499

Of the 8,499 rats caught this year 1,907 were Rattus rattus rattus.
2,728 ,, ,, ,, Alexandrinus.
3,864 ,, ,, ,, frugivorous.

Rat Fleas—The flea census per month together with the prevailing atmospheric conditions were as follows :—

MONTH.	Fleas per rat.	Average Temperature Shade.		Average Relative Humidity.
		Maximum °C.	Minimum °C.	
January	1.7	27.7	14.6	64
February	1.1	29.0	14.5	62
March	1.5	31.7	15.6	58
April	1.24	35.5	16.5	62
May	1.1	46.2	20.9	45
June	1.01	48.3	23.1	30
July	1.4	49.4	26.0	30
August	1.4	48.5	27.0	35
September	1.2	47.9	24.5	51
October	1.2	44.3	23.4	68
November	1.4	40.8	22.5	72
December	1.2	31.0	18.1	73

Water Supply. The water supply from Khor Arbat is tested annually. The report for 1937 was very satisfactory.

KORDOFAN PROVINCE.

Area 147,100 square miles. Population 1,222,729.

On the whole the health of the province has been satisfactory. Crops have been good during the last few years and evidence from the examination of school children and observation of the people generally, reveals a slight improvement in the general physique and well-being.

With the exception of one or two minor outbreaks of cerebrospinal meningitis and smallpox, epidemic disease was negligible. Malaria, schistosomiasis, syphilis, ulcers, eye diseases and dysentery provide the majority of cases attending hospitals and dispensaries.

This year the rains were average and well spaced with the result that, in common with the rest of the Sudan, there was a lower incidence of malaria. The disease continues, however, to be the chief medical problem of the province and is responsible for much sickness, loss of time and inefficiency. It should be possible to reduce further the malarial rate in towns by intensification of anti-mosquito measures and the treatment of cases but many infections are due to the infiltration of mosquitoes from adjacent areas where control is limited on the grounds of staff and expense.

The incidence of schistosomiasis is higher than in the previous year. With a large floating population in the principal towns, fresh cases are constantly arriving, but the treatment of infected cases tends to keep the disease under control.

Syphilis is the cause of 25% of the admissions to hospital in the Nuba Mountains area and is still very prevalent in Northern Kordofan.

A valuable addition to the public health work of the province was made by the appointment of a sanitary officer and seven sanitary overseers. The result of their efforts in improving conditions is already noticeable. Steady progress has been made in the sanitation of towns and a programme for the improvement of village sanitation initiated.

DARFUR PROVINCE.

Area 138,150 square miles. Population 715,543.

The province was spared the devastating epidemics of recent years. With the exception of a few cases of relapsing fever and mumps no serious outbreak occurred.

Syphilis, tropical ulcer, schistosomiasis, dysentery and malaria are among the more important endemic diseases. Ancylostomiasis appears to be fairly common in the western and southern areas. Leishmaniasis is endemic in the area around El Fasher.

The general standard of health of the inhabitants varies and appears to be lowest among the residents of the west and south. In this area the rainfall is heavy, the soil sodden and easily contaminated. As a result the sedentary, crowded population is prone to infection with chronic and debilitating diseases such as hookworm, malaria, syphilis and leprosy. The nomadic northerner to some extent is protected from these diseases by his mode of life, the dryness of the climate and the sterilizing effect of the sun.

In both areas the standard of hygiene is negligible.

The only sanitary work in the province is carried out at El Fasher and at the various district headquarters. The standard varies and is conditioned by the funds and staff available.

With the appointment of a sanitary officer in 1938, it is hoped to organise the public health work of the province on a uniform basis. Sanitary overseers will be posted to the more important towns and local boys will be trained in the principles of village hygiene and distributed through the districts.

UPPER NILE PROVINCE.

Area 100,400 square miles. Population 502,163.

The province was free from any serious epidemic. Smallpox of a mild type, imported from Abyssinia, occurred in the eastern district.

Malaria, trichiasis, tropical ulcer and syphilis are the major causes of invalidism. Leishmaniasis is considered to be spreading and may become a major problem of the future.

The control of malaria in this province with its vast area of marsh is a difficult problem. Even in Malakal, adequate mosquito control is impossible during the rains. Much can be done in the town itself, but mosquitoes are constantly introduced from the marsh on the west bank and by islands of floating weed. Personal prophylaxis and the destruction of adult mosquitoes in houses would appear to be the most hopeful means of reducing the malarial rate.

Tropical ulcer is very prevalent amongst the negroid tribes in the southern districts. The aetiology of this condition is obscure and little can be done in the matter of prevention other than ensuring the early treatment of cases.

Chronic inflamation of the eyes with its attendant complications is almost universal among the cattle owning people of the province. From earliest infancy these people spend their lives in an atmosphere of dust and smoke from dung fires. So intimately is the life of these people bound up with that of their cattle, that it is difficult to see how preventive medicine can play its part in reducing the appalling incidence. The most that can be achieved at present is the provision of facilities to ensure early and simple treatment before complications arise.

Public health work in this province is limited to the control of sanitation and mosquito breeding in towns. Much remains to be done in both directions but with increase of staff and facilities, a steady improvement has been maintained.

EQUATORIA PROVINCE.

Area 159,750 square miles. Population 1,129,000.

Curative medicine still claims the major share of the staff's activities in this vast area. The number of cases seeking treatment increases yearly and new dispensaries are called for. Many disease problems await solution, many endemic foci await staff for eradication and surgical cases are only limited by the capacity of the hospitals and staff available. It is recognised that to cope with all these demands would require personnel out of all proportion to the economic status of the province and that ultimate hope lies in prevention in its widest sense.

Hitherto, apart from sleeping sickness, leprosy and malaria in towns, little continued effort has been possible in the control of the great preventable diseases which cause so much hospitalization. Guinea worm, hookworm, tropical ulcer, bilharziasis, filariasis and dysentery are widespread and the cause of great disability. The policy of prevention is directed on the following lines. (1) Education, which includes training of medical and sanitary personnel and teaching in mission schools; (2) the provision of safe water supplies; (3) anti-malarial work and general sanitation, primarily in towns but later to be extended to villages; (4) maternity and child welfare work. Two British sisters were posted to Juba towards the end of the year, and already a promising clinic has been established ; (5) nutrition, which so far has barely been touched but is now receiving attention.

A training class for southern sanitary overseers was commenced in February. Lectures on sanitation are also given to the assistant medical officers under training.

Good progress has been made in mosquito control work in the Juba area. Drainage of swamp areas has been extended and improved and a Eucalyptus reafforestation programme initiated. A marked decrease in the incidence of malaria amongst northern Sudanese in Juba was noted.

Guinea worm is widespread and continues to be a cause of major disability. A well campaign has been started to counter this most crippling disease.

All the principal stations have been visited during the year and sanitary arrangements inspected.

Progress amongst these backward people necessarily will be slow but with the close co-operation of the administrative and tribal authorities a steady improvement year by year can be anticipated.

MATERNITY AND CHILD WELFARE.

MIDWIVES.

35 pupil midwives completed the course of training at the School of Midwifery, Omdurman. All passed the qualifying examination; 2 midwives attended a revision course.

304 midwives have been trained since the School opened 17 years ago. Of these 250 are still practising. Owing to local prejudice and opposition the field of selection of pupil midwives is limited. Great care has to be taken to obtain the right type of woman and each candidate must be selected from the locality in which it is intended she shall practise.

The fact that of the 304 midwives trained during this period, only 20 have been struck off the register is evidence of the care with which they have been selected and of the discipline and patience exercised during their training.

In Omdurman district, during the first eight months of the year, 1,344 cases were attended by trained and pupil midwives. Of these, 276 were abnormal deliveries, 24 were transferred to hospital, where one died.

In twenty cases a doctor was called to see the patient in her house but there was no death in the district.

Trained midwives in rural areas are making satisfactory progress, but as their methods are quite different to accepted and established native customs it often takes some time before a newly-trained midwife finds work in her village.

Arrangements have been made to open a subsidiary school at Juba where midwives will be trained for service in the southern Sudan.

MATERNAL MORTALITY.

The following statistics, relating to maternal mortality and the complications of child birth, are compiled from the returns of the Civil and Church Missionary Society hospitals in Omdurman, from the Midwifery Training School and the trained midwives of Omdurman.

These figures cannot be taken as typical of the whole of the northern Sudan, but they give some indication of the risks associated with pregnancy and parturition, conducted under the best available conditions.

Probably few, if any maternal deaths occur outside hospital ; therefore deaths amongst those admitted represent fairly accurately the maternal death rate. In Omdurman, during the past year there were 15 deaths and 1935 live births giving a maternal death rate of 7.7 per 1000 live births.

Total cases (for eight months)	1,482
Abnormal	360
Died	15

Complications and Cause of Death:—			Total.	Recovered.	Died.
Abortions			45	45	—
Puerperal sepsis ...	Normal labour ...	12			
	Abnormal labour	7			
			19	14	5
Puerperal haemorrhage	Placenta praevia	6			
	Other causes ...	28			
			34	31	3
Puerperal albuminuria and convulsions ...			4	4	—
Other toxaemias of pregnancy			—	—	—
Phlegmasia alba dolens			—	—	—
Embolism			—	—	—
Other accidents and abnormal conditions of the puerperal state			176	170	6
Illness complicating, but not directly due to pregnancy			82	81	1
			360	345	15

INFANT MORTALITY.

In the provinces the registration of births and deaths is incomplete and it is not possible to determine the infant mortality rate with any degree of accuracy. In Khartoum, Khartoum North and Omdurman the rate is 76.5, 102 and 94.3 respectively. These figures may be regarded as substantially correct. The rate for England and Wales for the years 1910-1920 was 100, that for 1936, 59.

MATERNAL AND CHILD WELFARE CLINICS.

Antenatal clinics have been opened in most towns in the northern Sudan to supplement the work already carried out at the local hospitals.

At the Omdurman clinics there were 4,229 attendances, of which 1,592 were new cases. Approximately 80% of pregnant women in Omdurman attended for antenatal examination and advice. There were a further 591 attendances for gynaecological conditions.

In Khartoum North and Khartoum district there are five clinics. There were 4,710 attendances of which 1,341 were new cases. It is hoped to augment this work by the institution of home visiting so that lessons learnt at the clinic will be put into practice in the home.

Clinics at Atbara, Shendi, Damer, and Berber in the Northern Province have been well attended. There are 28 trained and 119 licensed midwives in this area.

New clinics were opened at Kassala and Juba during the year and are making good progress.

SCHOOL MEDICAL SERVICE.

This service has been extended in most provinces of the northern Sudan. 26,444 pupils were examined in 332 schools as compared with 21,041 in 1936. It is estimated that 67% of the pupils attending Government or Government subsidised schools were inspected and treated during the year.

Although this work has been greatly increased as compared with other years, much remains to be done, especially in girls' and village schools.

The importance of this work need not be stressed. The large number of cases of preventable disease seen in outpatient departments throughout the Sudan emphasise the importance of early detection and treatment. In the northern Sudan trachoma is responsible for the majority of cases referred for treatment. In the south a high percentage of school children suffer from chronic malaria and ancylostomiasis.

About 10% of children in the northern Sudan are found to have carious teeth.

In Equatoria Province the large percentage of skin disease indicates that not enough attention is being paid to cleanliness of bodies and clothes.

With these exceptions the standard of health of school children is satisfactory and there is little evidence of malnutrition. In some instances a general improvement in physique has been noted.

The following table shows the results of the examinations :—

PROVINCE AND DISTRICT	No. Examined	% Trachoma	% Bilharzia	% Spleen	% Pulm T.B.	% Ankylost.
Blue Nile Province :—						
BLUE NILE DISTRICT.						
2 Intermediate ...	221	16.3	0.45	15.3	—	—
2 Girls Schools ...	221	32.1	—	9.5	—	—
3 Elementary ...	841	29.3	—	11.4	—	—
19 Village ...	2,665	23.1	0.15	18.8	—	—
FUNG DISTRICT.						
7 Elementary ...	666	20.0	2.2	54.8	—	—
2 Girls Schools ...	186	30.6	—	51.0	—	—
8 Village ...	437	30.6	0.45	33.1	—	—
Darfur Province :—						
3 Elementary ...	641	43.0	34.1	46.9	—	—
Equatoria Province :—						
JUBA DISTRICT.						
2 Intermediate ...	184	8.7	—	21.7	—	—
8 Elementary (Boys)	987	3.9	—	20.7	—	0.7
4 Elementary (Girls)	142	2.8	—	19.6	—	—
WAU DISTRICT.						
2 Intermediate —	171	5.8	3.5	20.4	—	9.9
5 Elementary (Boys)	441	5.9	4.3	17.4	—	14.5
1 Elementary (Girls)	18	6.6	—	—	—	—
TEMBURA DISTRICT.						
1 Elementary	263	—	22.0	—	—	23.5

Medical Examinations of Schools.—(*Contd.*)

PROVINCE AND DISTRICT	No. Examined	% Trachoma	% Bilharzia	% Spleen	% Pulm T.B.	% Ankylost
Kassala Province :—						
KASSALA DISTRICT.						
6 Elementary ...	433	58.2	—	22.1	—	—
21 Village	1,018	47.7	—	30.2	—	—
PORT SUDAN						
1 Intermediate ...	88	26.1	—	1.1	—	—
2 Elementary ...	286	57.3	2.4	4.5	—	—
1 Village ...	219	75.3	—	21.0	—	—
Khartoum Province :—						
Gordon College	321	23.4	—	0.9	—	—
Technical School	142	36.6	—	—	—	—
9 Intermediate ...	1,520	29.0	—	3.6	—	—
22 Elementary ...	3,164	43.4	—	2.7	—	—
Coptic College	454	28.8	—	1.3	—	—
Kordofan Province :—						
1 Intermediate ...	78	30.8	10.2	35.9	—	—
18 Elementary ...	1,709	27.9	16.3	29.8	0.23	—
11 Village ...	366	21.6	7.1	42.6	—	—
Northern Province :—						
WADI HALFA DISTRICT.						
1 Intermediate ...	53	—	30.2	—	—	—
1 Girls School ...	61	—	29.5	—	—	—
6 Elementary ...	686	54.8	11.9	4.2	—	0.72
55 Village ...	1,889	56.5	17.1	9.6	—	0.47
DONGOLA DISTRICT.						
4 Elementary ...	519	67.0	6.9	25.2	—	0.19
1 Girls School ...	82	40.2	—	6.1	—	—
24 Village ...	969	45.3	4.3	13.3	—	—
BERBER DISTRICT.						
2 Intermediate ...	116	37.0	1.7	3.4	—	—
1 Technical ...	49	22.4	8.1	6.1	—	—
3 Girls Schools ...	253	46.2	0.4	0.4	—	—
8 Elementary ...	1,131	42.7	3.2	10.0	—	—
41 Village ...	1,480	44.8	7.1	18.9	—	—
Upper Nile Province :—						
1 Elementary ...	128	30.4	2.3	14.8	—	1.5
3 Mission Schools	84	9.5	—	22.6	—	—
White Nile Province :—						
Teachers Training College	85	10.6	8.2	5.9	—	—
1 Intermediate ...	24	41.7	25.0	16.6	—	—
3 Girls Schools ...	230	35.6	1.3	23.0	—	—
7 Elementary ...	811	34.0	18.5	33.6	—	—
6 Village ...	174	27.0	11.5	28.7	—	—

QUARANTINE.

PORT SUDAN QUARANTINE.

Bombay was declared infected with smallpox in March 1935, Bankok with cholera in February 1936. Quarantine measures were still in force at the end of the year.

Quarantine restrictions for cholera against Ceylon which were in force at the beginning of the year were withdrawn in March.

	1932	1933	1934	1935	1936	1937
Ships arriving	808	778	886	1181	1148	1,174
Sailing Vessels	846	423	509	435	427	599
Warships British	7	14	15	60	24	20
,, French	2	6	6	3	5	—
,, Italian	—	—	1	3	—	3

No ships were quarantined during the year and no persons were isolated from ships. A few deaths occurred outside the Port, none were due to quarantinable disease. One case died in the Port of heart failure.

The health of the Port and Town was good throughout the year. With the exception of a few cases of diphtheria, chickenpox and mumps, there was no epidemic disease.

SUAKIN QUARANTINE.

All Sudanese and West African pilgrims in transit through the Sudan leave the country for the Hedjaz via Suakin and also return to this Port.

Under the term " West African " are included those pilgrims coming from the west of the Anglo-Egyptian Sudan. A certain proportion of these people so classified are, however, permanent inhabitants of the Sudan. It has been estimated that the average time for West Africans to make the journey to and from Mecca is as much as seven years. A large number work as labourers in the Gezira and the Gash and Tokar Deltas before going to and returning from the Hedjaz.

The pilgrim route from West Africa passes from Lake Tchad, through Fort Lamy, Abesher, Adre, Geneina and El Fasher to the railway at El Obeid.

The relative numbers of Sudanese and West African pilgrims for the last five years is an follows :—

	1933	1934	1935	1936	1937
Sudanese	449	558	931	1,315	1,728
West Africans	521	924	741	2,089	4,618
	920	1,532	1,672	3,404	6,346

It will be noted that the number of Sudanese pilgrims has remained fairly constant during the last three years and that the increase is mostly amongst West Africans. Work in the quarantine never closes down completely. By the time the majority of pilgrims have returned from one pilgrimage, others are already beginning to leave for the next.

All pilgrims are vaccinated before departure. A glycinerated calf lymph prepared in the Khartoum Laboratories was used this season for the first time. Results were eminently satisfactory. All pilgrims are also inoculated against cholera. In previous years the dose employed has been 1000 millions for each adult. This year, the following single doses were given:—

Adult males	4,000 millions
Children over 14	1,000 ,,
Infants	500 ,,

4929 pilgrims passed through Suakin on their return from the Hedjaz. All these had departed from Suakin.

The general health of the returning pilgrims was good. There was a relative absence of respiratory disease which had been very prevalent last year. A considerable number, however, contracted chickenpox and those who were considered still infectious were isolated. No case of smallpox occurred. The pilgrimage having been declared clean, the period of quarantine at Suakin was limited to 5 days. 85 cases were admitted to hospital of whom 5 died.

WADI HALFA QUARANTINE.

1667 Egyptian labourers passed through the quarantine. One was rejected as unfit. 98 were found to be infected with bilharzia and were treated either at Wadi Halfa or at their destination.

OPHTHALMIC REPORT

By Mr. A. R. McKelvie.

58 male beds and 30 female beds are provided for this Department in the River Hospital, Khartoum.

The following figures summarise the work carried out during the year.

	River Hospital.	Omdurman Hospital.	Total.
Inpatients	653	97	750
Outpatients			
Total Attendances ...	35,938	30,180	66,118
New Cases	7,640	3,777	11,417
Operations			
Major	488	47	535
Minor	457	269	726

Two outpatient departments are now established in Omdurman ; one in the new hospital for men and one in the women's hospital. Beds are made available as and when required for cases requiring inpatient treatment.

The Assistant Ophthalmic Surgeon, Hussein Ahmed Hussein, D.K.S.M., attended a course of postgraduate study at the Royal London Ophthalmic Hospital and at the outpatient department of the Westminster Ophthalmic Hospital during the year.

The following tables give the detail of cases treated and operations performed at the River Hospital.

IN-PATIENTS TREATED IN THE RIVER HOSPITAL EYE DEPARTMENT DURING 1937.

Months.	Eye Lid					Conjunctivitis				Cornea						Iris & Ciliary		Choroid	Retina			Optic nerve		Lens & Vitreous					Eye Ball			Orbits		Muscles of the eye				
	Injury to the lid	Blepharitis	Hordeolon & Chalazion	Trichiasis & Entropion.	Tumour of the Lid	Conjunctivitis	Trachoma	Pterygium	Dacryocystitis Lachrymal app.	Keratitis	Ulcerations	Perforations	Foreign Bodies	Corneal Wounds	Leucoma	Iridocyclitis & Iritis	Atrophy	Choriditis	Retinitis	Atrophy	Detachment	Pappilidoema	Atrophy	Cataract Congenital	Cataract Senile	Cataract Traumatic	Dislocation	Opacity of Vitreous	Injury and Panophthalmies	Primary Glaucoma	Secondary Glaucoma	Cellulitis	Malignant Tumour	Strabismus	Defective Vision	Vision test for Medical Examinations.	Staphyloma	Total
January	—	1	—	1	—	12	5	—	—	—	1	1	—	—	2	1	—	—	—	—	—	—	1	—	6	2	1	—	—	4	1	—	—	—	1	2	—	42
February	—	2	1	—	—	8	1	—	1	—	3	1	—	1	1	3	—	—	—	—	—	—	1	—	7	1	—	—	—	—	2	—	—	—	1	2	—	36
March	—	—	1	3	—	7	7	2	—	—	3	2	—	—	2	2	—	—	—	—	—	1	—	—	—	6	—	—	1	5	1	—	—	—	—	1	1	45
April	—	2	—	5	—	6	6	1	—	—	2	—	—	—	3	2	—	—	—	—	—	—	—	—	15	1	—	—	—	4	—	—	2	—	2	—	—	51
May	—	4	—	7	—	10	7	1	1	3	—	2	—	—	3	1	—	—	1	—	—	—	—	2	14	4	—	—	—	5	—	—	—	—	4	—	—	71
June	—	—	—	4	—	3	3	—	—	1	—	—	—	1	2	2	—	—	—	—	—	—	1	—	16	—	1	—	1	7	1	—	1	—	5	—	—	51
July	—	2	—	6	—	2	12	—	—	1	2	—	1	1	3	4	—	1	1	1	—	—	—	—	20	4	—	—	—	7	1	1	—	—	7	—	—	77
August	—	—	—	1	—	4	3	—	—	—	—	—	1	—	—	1	—	—	—	—	—	—	—	—	6	—	—	—	—	—	4	—	—	—	3	1	—	24
September	—	—	—	6	—	4	6	—	1	—	—	—	—	—	1	2	—	—	—	—	—	—	—	—	3	3	—	—	1	—	—	—	—	—	2	—	1	30
October	2	—	—	3	—	8	6	—	—	2	—	—	—	—	5	1	—	1	1	—	1	—	—	—	20	—	—	1	1	1	11	—	—	—	—	—	1	65
November	—	—	—	3	1	6	6	1	—	—	1	1	—	—	2	—	—	—	—	—	—	—	—	—	6	4	—	—	—	1	5	—	—	—	—	1	—	38
December	—	2	—	10	—	14	16	—	—	3	1	2	—	2	6	6	1	—	—	—	—	—	2	—	25	7	1	—	1	6	12	1	1	1	—	—	3	123
Total	2	13	2	49	1	84	78	5	3	10	13	9	2	5	30	25	1	2	3	1	1	1	5	2	138	32	3	1	5	40	38	2	4	1	25	7	6	653

OUT-PATIENTS TREATED IN THE RIVER HOSPITAL EYE DEPARTMENT DURING 1937.

Months.	Eye Lid					Conjunctivitis				Cornea						Sclera		Iris & Cillary Bodies					Choroid			Retina				Optic Nerve Lens & Vitreous								Eye Ball		
	Injury to the lid	Blepharitis	Hordeolon & Chalazion	Trichiasis & Entropion	Tumour of the lid.	Conjunctivitis	Trachoma	Pterygium	Dacryocystitis	Keratitis	Ulceration	Perforation	Foreign Bodies	Corneal Wounds	Leucoma	Scleritis Superficial	Injury	Iridocyclitis & Iritis	Injury to Iris Or Cillary Body	Prolapse to Iris	Cyst of the Iris	Caloboma	Injury	Choriditis	Tumour	Haemorrhage	Retinitis	Atrophy	Detachment	Papilloedema	Atrophy	Cataract Congenital	Cataract Senile	Cataract Traumatic	Diabetic	Dislocation	Opacity of Vitreous	Injury and Pan Ophthalmies	Primary Glaucoma	Secondary Glaucoma
January	15	—	—	7	—	99	122	1	—	—	15	—	10	—	3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	17	—	—	—	—	—	6	—
February	2	4	3	8	—	99	130	4	—	—	5	—	6	—	7	—	—	1	1	—	—	—	—	—	—	—	—	—	—	—	—	—	15	—	—	—	—	3	4	—
March	1	8	7	16	—	232	234	8	—	7	—	—	19	—	7	—	—	—	—	1	—	—	—	2	—	—	—	—	—	—	—	—	26	—	—	2	—	—	12	—
April	8	7	6	13	—	172	233	4	—	5	10	—	11	3	12	—	—	—	—	—	—	—	—	2	—	—	—	—	—	—	—	—	36	—		—	—	4	15	—
May	6	14	3	20	5	168	178	5	3	3	2	—	17	—	10	—	—	1	—	—	—	1	—	3	—	3	—	—	1	1	—	—	21	3	—	—	—	—	4	—
June	3	22	14	8	2	179	143	11	3	7	6	1	10	3	10	—	—	2	1	—	—	—	1	2	—	—	—	—	—	—	—	3	26	2	—	—	—	—	8	—
July	3	18	14	9	2	154	156	13	4	7	6	2	21	3	9	1	1	1	—	1	—	—	—	—	—	—	—	—	—	—	—	5	39	6	2	—	4	1	17	2
August	7	12	13	9	—	216	119	7	1	9	10	3	24	1	9	—	—	2	1	—	—	—	1	1	—	—	—	—	—	—	—	3	16	—	—	1	—	4	6	1
September	2	6	12	9	—	137	171	6	1	5	4	3	22	4	13	1	—	1	—	1	—	—	1	1	—	—	—	—	—	2	1	—	23	7	—	1	—	2	11	3
October	5	6	10	24	2	141	185	9	1	2	3	4	23	3	13	1	1	1	—	—	1	—	2	1	—	—	1	—	1	3	1	3	35	7	1	—	—	—	17	3
November....	3	12	17	12	—	139	187	13	2	6	10	—	21	3	9	—	—	—	—	—	—	—	1	1	1	—	1	1	—	1	—	1	10	6	1	—	—	6	6	1
December	3	11	12	6	2	174	160	11	2	5	7	4	23	11	—	1	1	1	1	—	1	—	1	1	—	2	—	—	—	2	—	2	26	3	—	—	—	7	6	5
TOTAL	60	120	111	141	13	1,910	2,018	92	17	56	78	17	207	31	102	4	3	10	4	3	2	1	7	14	1	5	2	1	2	9	2	17	290	44	4	4	4	27	112	15

Months.	Orbits		Muscles	Various				
	Injury	Cellulitis	Strabismus	Refractions	Vision test for Medical Examinations.	Staphyloma	Total New Cases	Total Attendances
January	—	—	2	60	92	—	449	1,854
February	—	—	4	58	85	—	439	1,652
March	8	—	3	106	142	2	843	2,960
April	—	3	10	102	131	—	787	2,590
May	—	—	13	104	122	3	714	2,085
June	—	1	6	66	81	4	625	2,413
July	—	—	2	53	90	9	655	2,013
August	—	—	3	36	127	2	643	2,542
September....	—	—	3	53	79	5	590	2,387
October	—	—	5	54	96	3	668	2,775
November....	1	—	5	29	71	4	584	2,615
December	—	—	3	65	67	6	643	2,412
TOTAL	9	4	59	786	1,183	38	7,640	28,298 7,640
								35,938

EYE OPERATIONS PERFORMED IN THE RIVER HOSPITAL DURING 1937.

Months	Cataract		Glaucoma													Tumours					
	Extraction	Needling	Sclerectomy	Trephine	Cyclodialysis	Filt. Iridectomy	Iridenclesis	Electro Thermo Cautery	Enucleation	Iridectomy	Plastic Operations	Pterygia	Staphyloma	Tattoo	Trichiasis	Benign	Malignant	Squint	Dacryocystitis	Minor Operations	Total
January	8	1	2	—	3	—	—	—	—	3	2	—	—	—	4	—	—	—	1	35	59
February	7	4	1	—	4	—	—	—	—	1	1	1	—	1	2	2	—	—	1	18	43
March	22	4	—	—	1	—	—	1	—	—	1	4	—	—	13	—	—	—	—	33	79
April	12	1	2	1	4	—	—	—	—	4	7	4	—	—	15	1	—	—	—	31	82
May	18	1	—	—	—	—	—	—	1	2	1	1	—	—	7	—	—	1	—	39	71
June	30	4	—	1	2	1	—	2	1	6	4	7	—	—	13	1	—	—	—	31	103
July	20	7	—	3	1	3	—	—	—	6	3	5	—	—	12	2	—	—	—	40	102
August	6	—	—	—	1	—	—	—	—	—	2	—	—	1	8	—	—	—	—	49	67
September	17	5	—	—	5	—	2	—	1	3	5	2	1	—	11	—	1	—	—	42	95
October	16	6	—	—	9	—	2	—	1	3	—	1	—	3	7	—	—	—	—	46	94
November	8	—	—	—	4	—	—	—	—	3	8	4	—	1	4	1	—	—	—	49	82
December	5	—	—	1	6	—	1	—	—	3	4	1	—	—	1	2	—	—	—	44	68
Total	169	33	5	6	40	4	5	3	4	34	38	30	1	6	97	9	1	1	2	457	945

STACK MEDICAL RESEARCH LABORATORIES.

By Dr. E. S. Horgan

RESEARCH.

Malaria. The mosquito survey in the Gezira has been continued by Mr. Lewis and a summary of his work will be found in the entomological section of this report. Other research work carried out during the year will be found under the appropriate subjects.

ROUTINE AND EDUCATIONAL ACTIVITIES.

A summary of the routine work is given at the end of the report. The total 20,432 represents an increase of 2,000 specimens on the 1936 figure. It is rather difficult to say what is the cause of this continued increase as much of the work formerly carried out in the Stack Laboratories is now done in the various hospital laboratories by the Sudanese laboratory assistants. The chief increases have been in Kahn tests, Widal reactions, blood films and throat swabs. The increase in blood films was partly due to the examination of numbers of natives coming to Khartoum from the area in which relapsing fever was present.

Hospital Laboratories. The great majority of hospitals in the Sudan have now clinical laboratories which are supplied by trained Sudanese laboratory assistants, the total cadre being 28. During the year five new boys were selected for training ; all these have been four years in an intermediate school, passed the final examination and are able to read and write both Arabic and English. Preference is given to boys who have already served as hospital attendants. Revision courses of four months were given to eight of the existing Sudanese assistants and it is gratifying to note that the average standard is steadily improving—a result in no small measure due to the painstaking teaching by the British laboratory assistants. The course of training is essentially that detailed in the 1935 Report with the addition of total red and white blood counts, and estimation of haemoglobin. Instruction in the Kahn test has been given to one more selected boy, but I am still of the opinion that the average Sudanese laboratory assistant is incapable of performing this test with sufficient accuracy.

ROUTINE EXAMINATIONS.

Pathological Specimens.

The total for the year was 411.

Post Mortem Examinations.

16 were carried out in Khartoum Civil Hospital.

NEOPLASMS.

178 were received of which 68 were benign and 110 were malignant. A list of the latter is appended. The classification is the same as that of previous reports.

Organ or Tissue.	Carcinoma	Sarcoma	Total.
Breast	9	0	9
Female Genitals	6	1	7
Bladder	2	0	2
Prostate	2	0	2
Lip and Mouth	6	3	9
Liver	2	1	3
Anus	1	0	1
Eye and Orbit	6	7	13
Neck	1	2	3
Skin	5	1	6
Maxilla	1	0	1
Leg	3	6	9
Foot	0	4 (including 2 melanomata)	4
Arm and Hand	2	5 (including 1 melanoma)	7
Bone	0	2	2
Parotid	2	0	2
Lymphatic glands	0	6	6
Lung	0	1	1
Abdomen	3	4	7
Site unknown	8	8	16
Totals	59	51	110

Sites of Election.

Liver. Two primary adeno-carcinomata.

Alimentary Canal. With the exception of one squamous carcinoma of the anus, there was an absence of neoplasms which could be definitely traced to the alimentary tract, a result which is in conformity with previous experience.

Breast. It is rather remarkable that four out of the nine carcinomata came from male breasts. Two of these were of a fungating alveolar type with ulceration, with symptoms of seven and eight months respectively, one being in a man of eighty years.

The other two were adeno-carcinomata in type.

Leg and foot. Three squamous carcinomata, one endothelioma and five sarcomata of the leg ; two melanomata and two sarcomata of the foot.

Finger. It is interesting to record a melanoma.

Abdomen. Of the three neoplasms one was an adeno-carcinoma with extensive deposits in the peritoneum ; one a massive metastasizing carcinoma with advanced colloid degeneration, and the third a tumour of an adeno-carcinomata type which may have possibly arisen from the gall bladder. The primary sites of the others were unknown as post mortems were not available.

Skin. Neoplasms other than those mentioned under Leg included four rodent uclers of the face and one carcinoma. The latter was from the chest wall of an albino and an epithelioma in type but very atypical. Histologically the tumour appeared to be of low grade malignancy.

The tumour closely resembled a case of parakeratosis in a Sudanese albino leading to the formation of epitheliomata described by Hewer (Brit. Jour. of Syphilis & Derm. 1932 Vol. XLIV—469) and two similar cases, also albinos, seen by the present writer in Khartoum Civil Hospital (not published).

The condition apparently arises as a result of the sun's rays on a skin unprotected by pigment.

RABIES. 150 brains from all parts of the Sudan were received of which 10 arrived decomposed and useless for examination.

48 were positive for Negri bodies, the distribution being 29 dogs, 10 donkeys, 4 oxen, 1 sheep, 1 camel, 1 mule, 1 horse, 1 human. The latter was from a man bitten by a wild cat and who developed symptoms after an incubation period of 44 days. No treatment had been given.

During the year two brains of " Zande " dogs were received from the Southern Sudan (Li Rangu and Sources Yubu). These dogs are a local breed used by the Azande for hunting and no case of rabies amongst them had been previously reported, although I understand that it is not uncommon for them to develop an illness of which irritability is a symptom leading to fatal paralysis.

It is stated that natives are often bitten by them during this illness but human rabies has so far not been reported. Both of the above brains however showed numerous and typical Negri bodies and there seems no doubt that the disease is true rabies although it has not been yet possible to obtain the virus for experimental study. This form of canine rabies of apparently very low infectivity for man seems to resemble the mild rabies the, so-called Oulou Fato in French West Africa described originally by Nicolau, Mathis and Constantinesco (Bull. Soc. Path. Exot. 1931 Vol. XXIV p. 931).

Rabies Vaccine. 53,835 c.cms. were issued of which 5,000 cc were issued to Nigeria. The temporary arrangement for supplying Nigeria came to an end in July as sufficient vaccine is now produced at Lagos.

ENTERIC FEVER.

There was the usual preponderance of infections from B. typhosum, 72 positive blood cultures compared with five of B. paratyphosum A and one of B. paratyphosum B. No inagglutinable (Vi) strains of B. typhosum were isolated during the year.

T. A. B. Vaccine. 10,000 c.cs. were issued—the method of preparation described in the 1936 report remains unchanged.

Widal Reaction. Technique.

The recent International experiment on the comparison of methods used by various laboratories has again emphasized the importance of working with standardized suspensions and uniform technique. It is sufficient to state that all Widal reactions in the Sudan are carried out in the Stack Laboratories by a single assistant who has had extensive experience with agglutination tests. The suspensions used as a routine are as follows:—

B. typhosum (H and O), B. paratyphosum A and B (O): this number has been found sufficient for all practical purposes. The "H" suspension is a formalised broth culture and the "O" suspensions are alcoholised agar cultures prepared according to Gardiner's method and all fresh batches are standardized against a standardized suspension obtained from Oxford.

It has been found however more convenient to express the results in terms of dilution of the serum instead of the more modern R. T., a term with which many clinicians are not acquainted and which might lead to confusion.

Widal Reaction in Suspected Carriers. The present routine is to examine the sera of suspected carriers for H and O agglutination but in view of the favourable results reported by Pijper (South Africa Med. Jour. 1937 Vol. XI p. 113) from the examination of sera for VI agglutinins, all sera showing positive O agglutination are now tested also against a Vi suspension. Admittedly few sera have yet been examined in this way but so far no positive results have been obtained.

Salmonella Food Poisoning. For many years a careful examination for bacilli of the Salmonella group has been carried out in numerous cases of food poisoning—a very common complaint in the Sudan—but until recently the results were uniformly negative and there is no doubt that the majority of such cases are of non-specific origin. Recently (December 1937) an outbreak occurred in Malakal in which six persons were affected and specimens of the faeces, vomit and sera of the patients were sent to Khartoum by air. From the faeces of three cases and a vomit of one were isolated organisms biochemically members of the Salmonella group. Preliminary serological tests show some but not all of these strains to be agglutinated to titre by a standard polyvalent group serum (Standards Laboratory Oxford) while the following monovalent specific sera (H) were negative, B. paratyphosum A, B. paratyphosum B, B. typhi murium, B. newport, B. enteritidis. There was also a well marked cross agglutination (O) 1 in 50 to 1 in 250 between some of the patients' sera, taken 10 days after the onset of symptoms, and the strains proving beyond doubt that the organism was the causal factor of the outbreak.

As soon as the various sera are available it is hoped to proceed with the serological identification.

SURVEY FOR TYPHUS FEVER.

Weil-Felix reaction : It is often a matter of surprise that clinical cases of typhus have never been reported from the Sudan and although from time to time various cases of suspicious fever have been noted there is no real clinical evidence indicating that such are Rickettsial infections and the few sera which it has been possible to obtain from such cases have been negative. It is obviously a matter of importance to determine whether such an absence of clinical typhus is apparent or real and during 1937 a survey has been carried out on a large number of human sera and also on the sera of wild rats.

Human sera were obtained from all parts of the Sudan ; a few were from cases of suspicious fever, some were the routine sera for Kahn reaction, some were sera sent in for the Widal reaction and which were negative for the enteric group, others were specially collected in out of the way districts in the Southern Sudan.

Rat sera (*R. rattus, R. alexandrinus* and *R. norvegicus*) were obtained from the larger centres of population in the Northern Sudan.

Three suspensions of Proteus were used, OX^{19}, OX^{2}, OK of which OX^{19} and OX^{2} were alcoholised agar cultures and OK a formalised broth culture, as for some unknown reason all alcoholic suspensions of agar cultures prepared from this strain showed some spontaneous agglutination.

Weil—Felix Reactions.

Human Sera — (1,000 Tested).

Strains	OK	OX^{2}	OX^{19}
Serum dilutions :—			
1 — 12.5	98	4	3
1 — 25	5	0	0
1 — 50	1	0	0
1 — 125	0	0	0
1 — 250	0	1	0
1 — 500	1	0	0

Rat Sera — (240 Tested).

Strains	OK	OX^{2}	OX^{19}
1 — 12.5	63	3	2
1 — 25	1	1	0
1 — 50	0	0	0
1 — 125	0	0	0
1 — 250	0	0	0

The results are clear cut and indicate the complete absence of agglutination (less than 1 in 12.5) in the majority of sera, while if the more usual dilution of 1 in 25 is taken as the minimal titre only 0.8% are positive. Only two of the sera show any significant titres; 1 in 250 OX^2 and 1 in 500 OK respectively. The former case could not be traced; the latter serum was sent in for routine Kahn test and enquiries of the man's previous history failed to elicit any information of significance.

Of the rat sera none showed a significant titre (1 in 50) and at dilutions of 1 in 25 or over, only two were positive (0.8%). The serological results from both human and rat sera would thus appear to confirm the clinical findings that fevers of unknown origin in the Sudan are most unlikely to be due to Rickettsial infections.

PRESERVATION OF CULTURES FROZEN AND DRIED IN VACUO.

The difficulties of carrying on stock subcultures in a dry and dusty climate like Khartoum are so obvious that any method which could guarantee the preservation of organisms over long periods would be of great value. Drying and freezing methods although popular for many years in the United States do not yet appear to have gained general acceptance in spite of their great advantages in preserving unchanged the virulence and antigenic structure of the organism. During the year a certain amount of work on this problem was carried out, the method used being that of Swift (Jour. of Bact. 1937 Vol. XXIII p. 411), an ordinary ice-salt freezing mixture being employed as CO_2 ice is not available in Khartoum.

The method is simple in principle but preliminary work has shown us that great care must be paid to details to obtain consistent results. Cultures of delicate organisms like gonococci or meningococci have been recovered after three to four weeks in the dried state but the results with cholera vibrios have for some reason been irregular. The work on vaccinia virus is detailed under its own heading. In collaboration with the Senior Veterinary Research Officer the viruses of cattle plague and foot and mouth disease have also been dried by this method, but the results are not yet available.

INVESTIGATIONS ON LEPTOSPIROSIS.

Jaundice is a clinical condition frequently encountered in the Sudan, but Weil's disease has not been found in any instance, although special attention has been directed to the identification of the spirochaete on many occasions. During 1934-1935 a series of 21 cases of obscure sporadic jaundice in Omdurman was investigated, but no evidence of leptospiral infection was found, either bacteriologically or serologically. During 1937 a further 5 cases in Khartoum area have been investigated also with negative results.

As it is generally agreed that infected rats and other small rodents play the most important part in the dissemination of Weil's disease it is of importance to know whether these animals are infected in the Sudan. A survey among the rats in the northern provinces was carried out during 1937, a total of 200 rats being examined. These were obtained from the Khartoum-Omdurman area, Port Sudan and Wad Medani at various times throughout the year. The species distribution was as follows: *R. rattus* 55%, *R. norvegicus* 42% *Avicanthus testicularis* 3%.

The examinations carried out were (1) examination of the kidney tissue by dark ground illumination, (2) inoculation of emulsified kidney tissue into guinea pigs (3) adhesion tests, kindly carried out by Major H. C. Brown of the Wellcome Bureau of Scientific Research, London.

It is interesting to record that these various examinations have completely failed to show any evidence of leptospiral infection among the rats. Brown and Alston, in their paper on the epidemiology of Weil's disease (Proc. Roy. Soc. Trop. Med. 1930 Vol XXX, 741) remark that as far as the records exist there is an apparent absence of the condition in Egypt, Arabia and Persia. The present investigations strongly suggest that in the northern Sudan, where climatic conditions are comparable, there is a similar absence of infection.

RELAPSING FEVER.

During the year relapsing fever has been prevalent among returning labourers from Abyssinia and Eritrea and the opportunity has been taken to carry out some studies on the infecting strains. The spirochaetes (*Borellia*) are found in the blood during the pyrexial stages of the disease, and vary in length from 10 u—40 u. Their shape and movements have been studied in living films by dark ground illumination, and correspond closely with text book descriptions. They are readily demonstrated in blood films by Leishman's stain. They disappear from the blood with the decline of the initial fever. In experimental infections in monkeys they have been observed to clump together and undergo a process of disintegration at this time. They are absent during the apyrexial period but reappear during the relapse.

Human Infection. In man the disease corresponds closely with the classical type of louse borne relapsing fever. It is neither remarkably severe, as in the Darfur epidemic of 1926, nor is the occurrence of healthy carriers, noted in the Gezira in 1930, a feature of the present epidemic. The blood infection is of medium severity, and often several fields have to be searched before the organisms are found. Examination of the blood of 325 healthy contacts failed to reveal any subclinical infections. It is however by no means unusual to find cases with a temperature of 100°—104°F. and spirochaetes in the blood who complain of no subjective symptoms ; such may possibly be regarded as ambulatory cases. The apyrexial period after the first attack of fever varies from 4—14 days. One injection of Novarsenobillon causes the disappearance of the spirochaetes from the blood in 48 hours, but may not prevent relapse.

Animal Infections. (a) Rats, guinea-pigs, and rabbits are insusceptible. White mice are susceptible but the course of the infection is extremely mild. The spirochaetes are found in the blood in less than 24 hours after inoculation. They are present up till 48 hours, but disappear within the next 12 hours. There is no relapse and the infection is symptomless and subinoculations are not successful. In gerbils the course is similar to that in mice but somewhat more variable. The first subinoculation may result in the appearance of scanty parasites in the blood, but these do not persist more than 24 hours and further subinoculations are not successful.

(b) Monkeys are susceptible, but individuals vary much ; out of three monkeys inoculated directly from an infected patient one proved resistant, one developed a relapsing fever similar to the human disease, and the third developed the typical initial pyrexia but did not relapse. Passage from monkey to monkey is successful, but it is not possible to state at the time of writing whether the strain will retain its virulence. Passage through monkeys appears to diminish the virulence for mice, reducing the period during which the organisms are found in the blood by about 24 hours.

The results of these inoculation experiments indicate that the organism is quite different as regards virulence from the typical spirochaete of African relapsing fever (*B. duttoni*) but closely resembles the so-called European or cosmopolitan strain (*B. recurrentis*).

The Vector. It has been possible to incriminate the louse as the vector and metacyclic forms of the spirochaete occur in large numbers throughout the body cavity of lice from infected persons. The percentage of infected lice varies from case to case (probably according to the duration of the disease, though it was not possible to verify this). In the lice from one case which was observed in Kassala the infection rate was as high as 60%. No evidence of hereditary transmission in the louse has been found, although many nits have been examined including a number deposited in captivity by infected lice.

As it has been stated (Bruns. A. Arch. f. Schiffs. n. Trop. Hyg. 1937 Vol. 41 No. 3 p. 343) that the Abyssinian and Somaliland strains of replasing fever may be tick borne, numerous *Ornithodorus* from Kassala and Khartoum have been examined, but no evidence of infection has been found. An attempt to infect these arthropods experimentally has been made by feeding over 50 *Ornithodorus* on patients and monkeys with heavy blood infections. Up to the time of writing, however, no evidence of successful infection of these ticks has been found either by dissection or the inoculation of susceptible animals.

YELLOW FEVER.

Work has been continued along the same lines as in 1936.

(1) **The examination of liver sections from fatal cases of obscure pyrexia.** During the year eight viscerotome specimens of livers were examined histologically but in no instances were the morbid changes suggestive of yellow fever.

(2) **Mouse protection tests.** In March, 1937, Dr. G. M. Findlay of the Wellcome Bureau of Scientific Research, London, visited the Sudan, and collected a further series of human and animal sera from the Nuba Mountains and Sennar districts.

(a) Human Sera. The results which will be published in full by him confirm completely the findings of last year. The high infectious rate (70% and over) in the Kau district is still noticeable as is also the apparent rural distribution of the virus, and a striking difference in the percentage of positive sera from adjacent and apparently similar districts.

The mouse protection test has also been carried out on the sera of a number of cases of obscure febrile jaundice. Of 34 sera nine have been positive and 25 negative. Little significance can be attached to a positive result in these cases unless a previous test (at an early stage of the illness) has been negative. In three cases in Malakal it has been possible to test the serum twice in this fashion, and the results are suggestive. Blood taken on the 10th day of illness was negative in all three cases. A second sample taken 12 days later, was negative in one case, but in the other two protected three out of six mice used in the test—a positive result, which has developed during the course of the illness.

The sera of five persons who visited Kau during the rainy season in 1936, were also tested by Dr. Findlay and all but one were positive. Two of these positives are particularly interesting—a British Medical Inspector whose blood was known to be negative a year previously and an Assistant Medical Officer from the northern Sudan, posted to Kau in 1936. They both had an attack of fever at the same time in Kau. It was noted that the fever was not influenced by Atebrin, and that a few evenings previously both had been badly bitten by mosquitoes while sitting out talking to local notables.

These results suggest that during the last two years there have been at least three human infections with the virus of yellow fever.

(b) ANIMAL SERA : In the 1936 report it was mentioned that immune bodies had been demonstrated in two cows from Kordofan, and in one monkey.

During his tour this year Dr. Findlay obtained sera from wild and domestic animals in Kau. Among the latter immune bodies were found in four out of 20 cows, two out of five dogs, and three out of 11 pigs. No positive sera were obtained from any of the wild animals from Kau, although numbers were tested, including ground squirrels, rats, monkeys, lizards, bats and mongoose.

An attempt was made in London to infect six gerbils, sent from the Sudan, with yellow fever, but these animals proved completely resistant to both neurotropic and viscerotropic virus intracerebrally.

(3) **Mosquito Survey.** This is considered in the Entomologist's report, but mention may be made here of the discovery of *Aedes* breeding in tebeldi trees in entirely rural surroundings, two miles from the nearest human habitation.

VACCINE LYMPH.

During the period 103 calves and 26 sheep were used ; the employment of the latter was partly experimental and partly due to an outbreak of cattle plague at the beginning of the year before quarantine was enforced. As a result of this epidemic the Senior Veterinary Research Officer very kindly offered not only to purchase suitable calves but arranged to have all animals kept in quarantine for 10 days. A few days after the pulp has been collected the calves are returned to the Senior Veterinary Research Officer who utilises them for the manufacture of cattle plague vaccine. It is not possible to adopt in the Sudan the system of hiring calves successful in various African colonies.

The yields of pulp were 24 gms. average per calf and 19 gms. per sheep and there is little to choose between them as vaccinifers, both giving lymphs of high potency.

A total of 1,000,000 doses was manufactured and owing to the extensive vaccination campaign carried out during the latter part of the year 500,000 doses have been issued during the months of November and December 1937. All lymph at present is glycerinated (a dilution of the original pulp 1 in 7.5) and is issued in collapsible metal tubes of approximately 1.5 c.cms. and 5.0 c.cms.

Research. Experiments are being carried out in two directions:

(1) **The treatment of lymph by chloroform as a bactericidal agent.** The method of bubbling the chloroform vapour through the glycerinated lymph is a modification of that used at the Lister Institute, Elstree, the details and other information being very kindly supplied by Dr. D. Maclean. It was soon found that the original method of bubbling the vapour for ½ hour at 37°C. then incubating at 37°C. for four to six hours and finally at 22°C. overnight destroyed most of the potency (end titres less than 1 in 100) and after a series of experiments the method now in use was elaborated. The vapour is bubbled through for ¼ hour at a temperature of 37°C. and then immediately blown off for ½ hour. The lymph is left in the refrigerator overnight and any remaining chloroform is blown off for another ½ hour at 37°C. The ethyl isocyanide test is always carried out to detect any traces of chloroform. It has been found that this treatment is sufficient to destroy all streptococci and staphylococci and to reduce the total count to less than 5 per mgm.

All lymph issued has been stored in refrigerators for at least eight to ten months at a temperature not exceeding 0°C. Any batch required for issue which shows staphylococci or streptococci on culture is treated with chloroform vapour. All batches are tested for potency on rabbits immediately before issue—the technique is that as used in the Government Lymph Institute, Colindale and every lymph issued must show a semi-confluent to confluent take on each of two rabbits at a dilution of 1 in 10,000.

Effect of high air temperature on potency. This problem is common to most tropical countries but even in a more marked degree in the Sudan where distances are great and maximum air temperatures for long periods may be over 95°F. The deleterious effect of heat on glycerinated virus is universally recognized and to overcome this tropical lymph institutes rely either on dried or lanolinated lymphs. For some years the latter (purchased) were used in this country but the results were very irregular and by no means satisfactory on the whole.

Dried lymph is obviously the preparation of choice but its use presents several problems ; there seems no efficient method for reducing its bacterial contamination, it is wasteful where only small numbers are vaccinated and it is doubtful how far one can rely on the relatively untrained native personnel to grind up the dried material with the diluent supplied.

The literature gives rather discordant results on the effect of prolonged high air temperature on dried lymphs, hence a series of tests has been carried out for the past year. A batch of lymph, with a potency of 1 in 200,000, was dessicated at 0°C. *in vacuo*, tubed in small ampoules *in vacuo*, half of which were put in an incubator at 37°C. and half left in the refrigerator. Periodical tests for potency have been carried out using the same rabbit for both preparations on every occasion.

	Stored at 0°	Stored at 37°C.
4 months	1 in 200,000—+	1 in 100,000—0
		1 in 10,000—a few isolated papules
11 ,,	1 in 200,000—+	1 in 10,000—0
		1 in 1,000—±
		1 in 500—+
		1 in 100—+

+ = confluent.
± = semi-confluent.

It would appear that while there was a large initial drop in potency after four months in the specimen at 37°C, the subsequent drop was less and even after 11 months such a lymph would pass the international standard for potency. These tests are being continued through another year.

Lesions in vaccinated animals. A period of 14 to 21 days elapses between collection of the pulp and subsequent slaughter of the animal for cattle plague vaccine and during this period several of the calves have developed high temperature and swellings of the legs and one died. The post mortem carried out on the latter by the Senior Veterinary Research Officer revealed a diffuse gelatinous exudate in all subcutaneous tissues and areolar tissues like the omentum.

The colour of this exudate was a striking feature, being of a rich lemon quite unlike the yellow of deeply coloured normal serum. No other lesions were noted. A similar but not such extensive condition has been noted in several other animals when they were slaughtered for cattle plague vaccine, the curious colour being a conspicuous feature of every case. A Van den Bergh reaction was carried out on the exudate of one case and the result was a negative direct but positive indirect suggesting that the pigment was a bilirubin.

The Senior Veterinary Research Officer informs me that in the many thousands of cattle slaughtered for various other purposes over a period of many years he has never previously seen a similar condition, which is thus reasonable to regard as post-vaccinial. I can find no mention of it in the available literature of vaccine lymph production but it must be remembered that in the great majority of institutes the cattle are either slaughtered immediately after pulp collection *e.g.* in the United Kingdom and other European countries, or else they are temporarily hired from their owners as in certain African institutes and returned after the pulp has been collected. In the former case there has been insufficient time for the condition to develop, in the latter the cattle are lost sight of as far as the institutes are concerned.

BIOCHEMICAL.

The attention of various observers has been attracted to a chronic type of mild glycosuria which is frequently encountered in the Sudan. Its relation to diabetes mellitus is not clear, and the only information available at present is the impression of clinical observers. During 1936 an investigation of some of these cases was begun in cooperation with the Senior Physician, Khartoum Civil Hospital and up to date some 70 glucose tolerance tests have been carried out. It is hoped that it will be possible to keep these cases under observation over a period of 5—10 years, correlating clinical findings from time to time with the results of glucose tolerance tests. One interesting fact which has already emerged from this work is the remarkable immediate response to treatment shown by some of these patients. This is evidenced not only by the disappearance of the glycosuria, but by an alteration in the shape of the blood sugar curve in the tolerance test indicating a true improvement in the ability to metabolise sugar.

SCHISTOSOMIASIS IN THE SOUTHERN SUDAN-POSSIBLE SNAIL VECTORS

S. Mansoni infections of a mild and in some cases apparently symptomless type are commonly encountered through the southern Sudan (Equatorial Province) but in many such areas it has apparently been difficult to find any possible snail hosts.

During a visit of the writer to the province in 1937 the opportunity was taken to search various rivers, pools and khors for sinistral varieties and numbers were collected in different places especially at Li Rangu and Wau. All snails were sent to Major M. Connolly, British Museum who has kindly identified them.

The results may be briefly stated as follows :—

Planorbis herbini (*pfeifferi* ?) *Pl. costulatus* and *Pl. natalensis* are widely distributed. With reference to their role as possible vectors, Major Connolly remarks " *Pl. herbini*, which may be nothing but a local race of *Pl. pfeifferi*, is very likely to harbour the same worms as *Pl. alexandrinus* and *Pl. pfeifferi* but I hardly think *Pl. costulatus* and *Pl. natalensis* (=*gibbonsi*) can be large enough to do so."

Physopsis didieri which many authorities consider identical with *Ph. africana* is widespread and, in all the localities I searched, was readily found, often in large numbers. Although known to be a vector of *S. haematobium* in many parts of Africa, *Ph. africana* has never been found naturally infected in the Sudan and all attempts to infect it experimentally with *S. haematobium* or *S. mansoni* have been negative. *Bullinus forskali* (=*truncatus*) has been found in some areas but in very few numbers. Taking into consideration the wide and plentiful distribution of *Pl. didieri*, and the fact that it is a proved vector in the northern Sudan, in the writer's opinion the circumstantial evidence strongly implicates this snail as the chief if not the only vector of *S. mansoni* infections in the Equatorial Province. A large percentage of the specimens found were infected with furcocercous cercariae but the morphology and measurements of the latter were quite unlike those of human schistosomes and up to date no specimen infected with *S. mansoni* has been found.

WATER SUPPLIES.

Bacteriological tests were carried out on 111 samples during 1937 ; the majority of these came from Khartoum, Omdurman, Wad Medani, Port Sudan and Atbara water supplies. With the exception of Khartoum, where sampling is more frequent, all important town supplies are examined quarterly.

In addition, regular examinations were carried out on swimming baths in Khartoum, including those of the British troops, Royal Air Force and Sudan Club.

SUMMARY OF ROUTINE EXAMINATIONS.

Blood—Kahn's Test	12,735
,, Widal Reaction	950
,, Cultures	480
,, Films	1,691
Cerebrospinal Fluids	94
Biochemical	100
Autogenous Vaccines	4
Pathological Histology (including examination of brains for rabies)	561

Faeces	1,298
Urine	724
Throat swabs :	
Diphtheria positive	119
,, negative	1,263
Sputum T.B. positive	10
,, ,, negative	68
Spleen smears (Kala-azar) positive	11
General Bacteriology	322

Summary of Faeces Tests.

Flexner isolated	3
,, Y ,,	35
Shiga	5
Schmitz ,,	3
Sonne ,,	0
Typhoid ,,	76
Amoebae present	13
Ova ,,	57
Negative	1,106

Summary of Urine Tests.

Typhoid isolated	35
Ova present	2
Negative	687

Summary of examinations of Blood Films for parasites.

Malaria.	
Benign tertian	58
Subtertian	199
Quartan	6
Relapsing Fever	0
Negative	1,428

Summary of Widal Tests.

Typhoid	145
Paratyphoid A	0
Paratyphoid B	0
Melitensis	39
Negative	766

Summary of Blood cultures.

Typhoid	72
Paratyphoid A	5
Paratyphoid B	0
Melitensis	3
Streptococcus	10
Other organisms	16
Negative	374

Total examinations for 1937 = 20,541.
including water tests.

MEDICAL ENTOMOLOGY

By Mr. H. W. Bedford

Government Entomologist.

1. Introduction.

The present report is a resumé of the work of the Entomologists of this section, detailed for Medical Entomology, and covers the period January to December, 1937.

Mr. F. G. S. Whitfield has continued as lecturer in charge of biological teaching at the Kitchener School of Medicine and the Gordon Memorial College and in studying local entomological problems of medical importance.

Mr. D. J. Lewis has continued an intensive study of the problem of mosquito control in the Gezira and since August has been in charge of all determination work in connection with a mosquito survey of the Sudan.

2. Survey of Insects of Medical Importance.

(a) Mosquitoes. There has been a large increase in the number of mosquitoes sent in for determination. Of these 3,392 specimens have been identified, of which 218 were Anopheline and 3,174 Culicine. Of the latter 346 were *Aedes aegypti,* and 101 *A. vittatus,* Bigot. Other species of the *Stegomyia* group represented were *A. metallicus,* Edw. and *A. luteocephalus,* Newst. In addition to the above, large numbers of mosquitoes have been sent to the Imperial Institute of Entomology, the determinations of which have not yet been received, while several thousands of specimens collected in the Gezira have also been identified.

It is of interest to note that *Anopheles (Myzomyia) rupicolus,* a species new to science, was collected from Jebel Moya and described by Mr. Lewis, while records new to the Sudan include *Harpagomyia taeniarostris,* Theo., *Taeniorhynchus maculipennis,* Theo., *Ficalbia plumosa,* Theo., *Aedes ingrami,* Edw. and *Culex inconspicuosus,* Theo. collected by Mr. Ruttledge at Meridi.

(b) Other Insects of Medical Importance. Apart from insects collected from aircraft more than 500 specimens have been determined, including 400 tsetse flies (*Glossina palpalis* and *G. morsitans*), 27 fleas, numerous Tabanids, Chironomids and other biting flies. New records for the Sudan are *Culicoides eriodendroni,* C.I. & M., a biting midge, from Li Rangu, and *Xenopsylla nubicus,* Roths., a flea, collected from rats at Juba.

The finding of large numbers of the tick, *Ornithodorus savignyi* at Shambat is also worthy of note.

3. Collection of Insects from Aircraft.

During the year 873 insects were collected from commercial aircraft arriving from Egypt (234), South (244), Eritrea (313) and the West (82).

The majority of insects have been determined and included Diptera 824, of which only 7 were mosquitoes, Coleoptera 19, Hymenoptera 13, Lepidoptera 8, Dermaptera 4, Orthoptera 4, Rhynchota 1 and Trichoptera 1. Several species of interest are included among the specimens.

4. Survey of Mosquitoes in Khartoum and Urban District.

For many years the control of mosquitoes in Khartoum undertaken by the public health staff of the Sudan Medical Service has been most efficiently carried out. It is extremely rare that an adult mosquito is allowed to hatch out in the Khartoum rban uarea. Nevertheless minor outbreaks of malaria continue to occur during the winter months, and in an endeavour to solve the problem of this ultimate control of malaria in Khartoum a special survey of mosquitoes in Khartoum Urban area has been undertaken jointly by the Medical Officer of Health and the Medical Entomologist.

The work was started in August and from then until the end of the year 234 specimens have been determined, the majority of which were bred out from the larval and pupal stages. Of these 157 were Anopheline, including *A. gambiae* (111), *A. squamosus*, Theo. (1). Culicines were represented by *Culex tigripes*, Grandpre, *C. univittatus*, Theo., *C. antennatus*, Beck., *C. pipiens* (group) and *Aedes vittatus*, Bigot.

5. Control of Chironomids in Khartoum.

Experiments started in 1936 in connection with the control of Chironomids (*Tanytarsus spp.*) in Khartoum have been continued.

Trials with acetylene flares, in an endeavour to provide householders with a reliable trap which will help to clear their gardens of the flies, have been pursued using a special flare obtained from England for the purpose.

Results from oiling the foreshore of the Blue Nile with a view to controllihg the emergence of adults are not yet available.

Much information has been and is being collated regarding the dates and distribution of swarms of these flies throughout the period of their activity in which householders are playing an active part in supplying the information required.

6. Investigation to ascertain the Insect Vector of Loa loa in the Zande District of Equatoria Province.

Mr. W. Ruttledge, Entomologist, was detailed in January 1937 to assist Dr. Woodman, Senior Medical Inspector at Li Rangu, in carrying out transmission experiments in connection with *Filaria Loa loa*.

In 1922 Connal demonstrated that *Loa loa* is transmitted in West Africa by *Chrysops silacea*, Aus. and *Chrysops dimidiata*, Van der Wulp.

Although filariasis due to *Loa loa* is prevalent at Li Rangu, *Chrysops* species are by no means abundant, and neither of the two species which occur there feed habitually on man. It was found in August 1935 that they can however usually be obtained in fair numbers from the few small herds of trypanosomiasis-resistant cattle kept in Government stations in the district. The species which occur are *C. distinctipennis*, Aus. and *C. longicornis* Macq., the former being by far the commoner. Despite this apparent reluctance to feed on man, it had been decided by Dr. Woodman that transmission experiments should start with these two species and should if possible also include other prevalent species of diurnal biting flies. Two difficulties immediately confronted Dr. Woodman; firstly, to persuade more than a small percentage of the

Chrysops to take a blood meal, either from man or cattle, and secondly to keep fed flies alive long enough to enable possible development of *Loa loa* to take place in them.

During the three weeks spent at Li Rangu, Mr. Ruttledge was able to demonstrate a simple method of keeping the flies alive under laboratory conditions and of getting them to feed both on animals and man, thus making it possible to carry out the transmission experiments.

The majority of flies used for the experiment were *Chrysops distinctipennis*, the commoner local species, with a few *C. longipennis.*

To a minor extent trials were also made with the two *Tabanids, Haematopota decora,* Walk. and *H. vittata,* Loewe, and the two Muscids, *Stomoxys nigra,* Macq. and *S. calcitrans,* L.

7. Mosquito Research in the Gezira.

Work has been continued on *Anopheles gambiae* and *A. pharoensis* with the object of finding out if a further knowledge of their bionomics under the unique Gezira conditions could add to the efficiency or reduce the cost of present control measures. It is remarkable that in this extensive area under irrigation, it is difficult during several months in the year, to find fourth stage *Anopheles* larvae, although thousands can readily be obtained in various uncontrolled places outside the scheme.

1. BREEDING PLACES OF ANOPHELES. Nine species of *Anopheles* have already been recorded from the Gezira and in 1936, of the specimens identified (12,247), 92% were *A. gambiae* aad only 6% *A. pharoensis.*

In the table below are shown the identifications of adults obtained from different types of breeding places :—

BREEDING PLACE.	Nos. identified	Percentage of Total Identified				
		A. gambiae	A. pharoensis	A. rufipes	A. squamosus	A. coustani
Canals (weed grown)	170	28.8	57.6	2.4	10.0	1.2
Minor irrigation channels	2,119	95.3	2.1	0	2.6	0
Gardens	91	96.7	1.1	0	6.5	0
Rain pools	77	70.1	23.4	0	6.5	0
Dura cultivation ...	105	94.3	3.8	0	1.9	0
River rock and mud pools	1,384	99.0	0	1.0	0	0
Flooded forests ...	472	49.2	42.8	7.4	0	0
Sennar Reservoir ...	112	10.7	84.9	3.6	0	0.8

The more important breeding places are rain pools, field irrigation channels and irrigated dura. *A. gambiae* also breeds to a certain extent in garden gadwals and rain irrigation channels and except during the rains is the only species which breeds in the cotton cultivation.

Large numbers of Anopheline and Culicine larvae appear in canals at certain times of the year among several species of water plants, which if allowed to remain would provide very suitable conditions for breeding. This is prevented, however, by systematic cleaning of most canals which is carried out not only as a control measure against mosquitoes and harmful snails but also to accelerate the flow of water. Of Anopheline larvae found in such canals *A. gambiae*, the principal vector of malaria, constitutes 30%.

In the table below are shown the seasonal fluctuations of *A. gambiae*, the figures representing the sum of the average number per square metre in certain field channels each month.

MONTH	Larvae 1936	Adults 1937
January	0.1	2.5
February	8.4	1.7
March	105.3	0.4
April	61.4	0.5
May	0	0.2
June	0	0
July	0	0
August	3.5	8.3
September	15.4	17.6
October	74.0	8.7
November	35.8	3.2
December	18.6	2.0

From the above table it will be seen that there were two periods during which a noticeable increase in numbers of larvae took place. The first which started in March, although apparently the greater, was in reality of less importance owing to breeding places being localised, smaller in extent, and of shorter duration than in the second period during and immediately subsequent to the rainy season. Information was also obtained on the proportion of old larvae and pupae in each breeding place.

From the point of view of the incidence of Anophelines, the year can roughly be divided into five periods as follows :—

(1) Early November to late February. *A. gambiae* is always present but not abundant, while other species are very scarce.

(2) Late February to mid-April. Larvae of *A. gambiae* become numerous in small irrigation channels, whilst adults still remain inconspicuous.

(3) Mid-April to the end of June. After irrigation has ceased *A. gambiae* still continues to breed in very small numbers in gardens, sluices, etc., but never disappears completely.

(4) Early July to late August. There is little increase in the numbers of the mosquitoes in spite of rain.

(5) Late August to early November. *A. gambiae* increases and becomes common in villages and other species also appear. Anopheline adults are abundant near irrigated cotton and dura and larvae are common in many breeding places.

As is only to be expected the numbers of mosquitoes vary from year to year. Before the irrigation scheme was started mosquitoes presumably had a short period of breeding corresponding to the rainy season, and were absent during the remainder of the year, as they are now in comparable areas. During the early years of the scheme mosquitoes were more abundant than they are under existing conditions and two species of *Anopheles* previously recorded by Dr. Bryant in this area are not now found. The large lugguds which formerly acted as suitable breeding centres have now been reduced by pumping and drainage to mere depressions of only occasional importance.

At the present time *A. gambiae* which is always present in the Scheme has a period of increase in the rains, which varies in intensity. This variation would appear to be due to a combination of both rainfall and irrigation and the period of the year during which greatest rainfall takes place would seem to be of more importance in this respect than the total amount.

In connection with the breeding of *A. gambiae* in cotton irrigation channels the relationship between numbers of larvae and proximity to villages is most striking. Although there are thousands of irrigation channels of standard size watered from the same source and treated in approximately the same manner, the distribution of larvae has been found to be by no means uniform but chiefly localised round certain centres, which is most marked during the period November-April.

2. ADULT MOSQUITOES. The only species which occur in large numbers in this area are *A. gambiae* and *A. pharoensis*, of which the former is by far the more plentiful.

Seasonal changes in the numbers of *A. gambiae* have already been illustrated in the table above, which gives the average monthly catch from seven stations, selected owing to their isolation and suitability for attracting mosquitoes.

More than 1,000 adults have at times been taken in a single occupied hut, alongside the cultivation, whereas simultaneous collections in villages have produced very few specimens or negative results.

It should be emphasized that the interval which elapses between the commencement of the rains and a noticeable increase of adults is of importance when planning anti-larval measures.

The micro-climatic conditions under which mosquitoes live are regarded as important. Owing to irrigation the breeding season of *A. gambiae* is prolonged beyond the time when atmospheric conditions are favourable to the adult. The maximum shade temperature is often found to be several degrees above the thermal death point of the adult and also nearly 10°C above the maximum temperature considered favourable for the development of *Plasmodium* in the mosquito.

In consequence it may prove that an increase of *A. gambiae* at certain times does not necessarily involve an increase in infected individuals.

3. TRANSMISSION OF MALARIA PARASITE. During 1936 and 1937 dissections were made of 528 *A. gambiae*, of which only 6 (1.1%) were found infected with sporozoites in the salivary glands. Of 249 *A. pharoensis* dissected none contained sporozoites. The two species however were not collected simultaneously.

4. EXPERIMENTS ON CONTROL METHODS. During 1936 experiments with Paris Green to replace the previous method of control by oiling were carried out on the Gezira Research Farm. Later the former was adopted for this area as a regular control method and its application extended. As a diluent, sifted river silt obtainable near at hand proved most efficient. The greatly reduced numbers of larvae and adults of *A. gambiae* in this area during 1937 are an indication of the success of this measure.

No ill effects from its use have been reported, although water treated with Paris Green has been used for human consumption in spite of warnings, and lucerne regularly dusted has been fed to animals without injury.

In the Sennar Reservoir experiments in dusting from a boat have proved most effective in killing Anopheline larvae in thick weed which could not have been treated with oil.

Similarly treatment of lugguds in the Gezira by Paris Green dust produced most encouraging results.

In several parts of the world the importance of controlling adults as well as larvae has been emphasized. Such would appear to be the case at Wad Medani where, in spite of the almost complete absence of larvae of *A. gambiae* within the environs of the town during the dry season, adults may generally be found in small numbers throughout the irrigation period. Wire window traps, modified from the Le Prince and Orenstein type have been found effective under certain conditions and thousands of adults of this species have been trapped in this way, including several shown to be infected with malaria.

5. ANOPHELES PHAROENSIS. This species breeds in grassy places and is commonly met with in canals, irrigated dura, sunt plantations, areas flooded by the river and in the Sennar Reservoir, where it is the dominant species.

It enters houses at night, biting readily, but is seldom found in them during the day when it usually rests among vegetation. It is probably more attracted to animals than man.

More information is required on the importance of this species as a vector of malaria concerning which there has been much discrepancy of recent years among workers in various parts of Africa.

6. PRACTICAL APPLICATION OF MOSQUITO CONTROL METHODS. These will be discussed in relation to the five periods already described above.

Period 1. Control of *A. gambiae* by baling and oiling as adopted in the past has been proved to be very effective and any very radical change at this stage is not recommended.

In this connection, the irrigation zone in the Gezira is intermediate between a town area in which elaborate methods can be employed, and a rural area, in which only general measures can be taken. The general use of Paris green throughout the Gezira can hardly be regarded as a practical proposition but its use might with advantage be adopted for control round the localised breeding centres to which reference has already been made, treatment of lugguds and similar areas.

Period 2. The marked increase of *A. gambiae* is but of short duration and the ability of the adult to transmit malaria at this period owing to temperature conditions seems doubtful.

Period 3. Mosquitoes are very scarce.

Period 4. General oiling not recommended as it would seem an expensive way of dealing with a few scattered larvae.

Period 5. During the rains, since it is often impossible to get field channels dried out, the most hopeful method of control is probably the use of Paris green or other larvicide carefully planned with regard to the location of the more important breeding places. This is complicated by local annual variations in rainfall and difficulties of transport at this period.

With regard to mosquito breeding in the dura cultivation during October, control is a difficult problem and its importance is doubtful in view of the atmospheric conditions prevailing at the time and their possible effect on the malaria parasite in the invertebrate host.

The Blue Nile North of Sennar.

Along the Blue Nile mosquito breeding is more or less continuous throughout the year. From October to June *A. gambiae* breeds in rock, mud, and sand pools. By July these have been covered by the river as it rises and in years of good flood, forests and neighbouring grass lands form suitable breeding areas for many species of mosquitoes several of which are typical of the Southern Sudan.

The proportion of *A. gambiae* varies according to the type of tree growth and vegetation and the level of the flood The forests form an important source of mosquitoes found in towns and villages along the edge of the Scheme, but *A. gambiae* is not necessarily concerned.

Sennar.

Many species of mosquitoes breed at Sennar, *A. pharoensis* is the predominant species of *Anopheles* and breeds in variable numbers from July to April in the floating mass of *Echinochloa* grass found in the reservoir. Observations have indicated that the control of this species could be obtained if a means of controlling *Echinochloa* could be found. Various small scale experiments were carried out in the Spring of 1937 with this object including :—

1. TREATMENT BY CHEMICALS.

Trials were made with sodium chlorate and sodium carbonate. The former killed the existing weed but it is too early to know whether treatment will have a lasting effect. Application of sodium carbonate proved very difficult as the solution quickly soaked into the mud.

2. Replacement of *Echinochloa* by other plants. Various species were tried but were planted insufficiently early for the plants to become established before the flood.

3. By accelerating the natural process of silting up of the area supporting the main mass of weed growth in the reservoir. Two methods have been tried ; the first by cutting small channels to encourage silting and the second by the accumulation of masses of cut vegetation. Both methods, although slow, should ultimately have a permanent effect as regards control during the period July-November. Their action is to assist rather than oppose the natural plant succession.

The breeding of *A. gambiae* is much more localised and in the reservoir itself is more or less confined to the edges, where it can probably be kept in check by means of dusting with Paris green.

The White Nile Reservoir. In a preliminary survey it was found that the problem of mosquito control at Jebel Aulia is likely to be somewhat similar to that at Sennar. The same species of water plants and many others in addition occur there and will probably be found to play the same part in encouraging mosquito breeding as in the Sennar Reservoir.

PROGRESS OF WORK.

Curative Medicine. The following figures show the number of inpatients, outpatient attendances and operations performed during the last ten years :—

Year.	Inpatients Admitted.	Outpatient Attendances.	Operations Performed.
1928	39,965	2,004,283	3,913
1929	46,033	2,675,085	4,337
1930	49,911	3,840,923	6,110
1931	59,763	4,044,439	6,798
1932	59,642	4,264,412	7,287
1933	70,315	5,092,999	8,600
1934	85,990	6,039,197	10,082
1935	89,093	6,112,303	11,124
1936	96,081	6,500,441	11,229
1937	101,088	6,675,989	12,063

It is expected that the figures will remain established at about the present figure and will form some indication in future of the state of the public health of the community. The local medical authorities report that this is already the case as regards the Gezira hospitals and dispensaries.

Hospitals. At Omdurman the new outpatient department for men and an additional wing, holding fifty beds, were opened during the year, thus completing the new hospital for men. Additional ward accommodation was provided at Port Sudan where the increased activities of the port have been reflected in the demands on hospital accommodation. A new outpatient department and a ward for women were opened at Juba. A sudden unexpected rush of work at Malakal hospital at the beginning of the year resulted in considerable overcrowding in the wards and the extension of the irrigated area in the northern Gezira has resulted in an increase in work at Abu Usher Hospital.

Taking the Sudan as a whole the curative services are adequate but new extensions have been planned to meet special exigencies, such as the creation of the Jebel Aulia reservoir and the increased popularity of the Khartoum specialist services. In addition, it will be necessary to replace two of the Khartoum hospitals in the near future, as the buildings are old and the opportunity will be taken to site them more conveniently than at present.

Special attention is being paid to improvement of buildings, and better training of staff. Two British sisters have been posted at Juba to organise a nurses' and midwives' training school for the southern Sudan.

Preventive Medicine. Considerable progress has been made in the development of this branch. Sanitary officers and sanitary overseers have been trained as fast as facilities will allow and an adequate supervisory staff will be provided for the whole Sudan by the end of 1938.

Special attention is being paid to housing and village sanitation.

Medical Research. A cadre of trained laboratory assistants has now been formed to staff the hospital laboratories.

The malaria research in the Gezira, with special reference to the human carrier and the mosquito vector, was continued throughout the year under the control of a medical entomologist.

Further investigations were carried out regarding the possible existence of yellow fever. In this work we were fortunate in obtaining the assistance of Dr. Findlay, of the Wellcome Tropical Research Bureau.

Research was carried out regarding the possible existence of typhus and Weil's disease in the Sudan.

The production of local calf lymph, which commenced in December, 1936, was continued throughout the year except during the hot weather, and proved of great value in dealing with the outbreak of smallpox in the autumn. Over a million doses were produced.

TRAINING.

Courses of training are organised for the following categories of medical and sanitary staff:—

- Medical Officers
- Dispensers
- Asst. Medical Officers
- Asst. Radiographers
- Laboratory Attendants
- Hospital Orderlies
- Sanitary Officers
- Sanitary Overseers
- Female Nurses
- Midwives

90% of the male classified officials of the Sudan Medical Service are Sudanese.

Medical Officers. (See Kitchener School of Medicine Report page 87.)

Dispensers.

A two years course of training was continued during the year. Four selected assistant medical officers are under training of whom one was returned to duty as unsuitable.

Assistant Medical Officers.

Eleven selected hospital orderlies underwent a twelve months course at Omdurman hospital which had not been completed by the end of the year.

Laboratory Attendants (See page 64.)

Assistant Radiographers.

One was under training during the year.

Hospital Orderlies.

A six months course in nursing and hospital routine for senior orderlies from provincial hospitals was held at the Khartoum Civil Hospital under the Matron.

Nurses Training School.

13 pupils were accepted for training during the year of whom 7 were discharged for various reasons.

Nine were examined on completion of a two years course of training and seven were successful.

Midwives Training School. (See page 53.)

Sanitary Officers. (See pages 31-32.)

Sanitary Overseers. (See pages 32.)

Post-graduate Training.

Two Sudanese doctors completed a three months course of post-graduate study in London, one at the British Post-graduate Medical School and one at the Royal London Ophthalmic Hospital and at the outpatient department of the Westminster Ophthalmic Hospital.

KITCHENER SCHOOL OF MEDICINE.

ANNUAL REPORT.

By Mr. D. R. MacDONALD.

Number of Students.

No new students were admitted in 1937. The classes were composed as follows: —

Medical Students: —	
2nd Year	8
4th Year	8
Sanitary Students —	
3rd Year	2
Total	18

As no first year classes were held during 1937 the Biology, Chemistry and Physics Laboratories were used to train 14 selected students in Zoology, Chemistry and Physics with a view to their subsequent further selection as medical, agriculture and veterinary students. These 14 students were housed in the hostel of the Medical School and received the same privileges as the medical and sanitary students.

Progress of Classes.

Professional examinations were held in 2nd and 4th year subjects. Special final examinations were held in the case of the student who was referred in 1936.

2nd Year Examination Results.

Eight candidates were examined in Physiology. All the candidates reached the required standard and will continue their studies in the 3rd year subjects.

4th Year Examination Results.

The School was fortunate in obtaining the services of Professor W. W. Jameson, M.D., F.R.C.P., D.P.H., Dean, and Director Division of Public Health, London School of Hygiene and Tropical Medicine, as Assessor in Public Health and Pathology.

Seven students were examined in these subjects and all were successful. The Balfour Prize in Public Health was awarded to Sid Ahmed Abdel Hadi.

Special Final Examinations.

Special final examinations in Medicine, Surgery, Midwifery and Gynaecology, Pathology, Public Health, and the General Paper were held for the student who was referred in the previous year. The candidate was successful in Medicine, Surgery and Midwifery and Gynaecology, but failed in the other subjects. He was referred for a further term in the subjects in which he failed.

Presentations to the Medical School.

(1) A collection of books from the library of the late Michael Comport Grabham, Esq., M.D., L.L.D., F.R.C.P., F.L.S., was presented by G. W. Grabham, Esq., O.B.E., M.A.

(2) A gift of £200 was received from Lt.-Col. E. S. Jackson, C.M.G., D.S.O., for the endowment of three Jackson prizes in Medicine, Midwifery & Gynaecology and Pathology respectively.

Teaching Staff.

(1) Mr. F. S. Mayne retired from the Lectureship in Applied Anatomy. Mr. F. Bartholomew was appointed in his place.

(2) Dr. R. M. Humphreys was appointed Lecturer in Applied Physiology.

Health.

The health of the students was satisfactory during 1937. No cases of serious illness occurred in the course of the year.

Games.

The students continued to take a keen interest in association football and tennis. The standard of tennis improved to such an extent that two students were entered for the Sudan Club Tournaments held in January, 1938.

HEALTH

OF THE

SUDAN DEFENCE FORCE

By Mr. N. Macleod.

GENERAL.

The health of the Sudan Defence Force was satisfactory and unaffected by any serious epidemic.

The following table compares the sickness rate for the last ten years:—

Year	Average Annual Strength	Admissions	Average Constantly Sick	Ratio per 1000 of strength		Days lost through sickness	
				Admissions	Average Constantly sick	For whole force	For those sick
1928 ...	7,086	4,840	157.86	683.03	22.27	8.14	11.9
1929 ...	7,024	4,916	145.20	699.88	20.67	7.54	10.78
1930 ...	6,527	4,817	158.91	738.01	24.34	8.88	12.04
1931 ...	5,333	4,194	96.65	786.42	18.11	6.61	8.41
1932 ...	4,828	4,054	111.70	839.68	23.13	8.44	10.05
1933 ...	4,919	4,097	120.50	832.89	24.49	8.94	10.73
1934 ...	4,715	4,219	132.27	894.80	28.05	10.24	11.44
1935 ...	4,726	3,419	121.34	723.44	25.67	9.41	13.00
1936 ...	4,440	3,669	117.24	826.35	26.40	9.64	11.66
1937 ...	4,444	3,638	120.84	818.63	27.19	9.92	12.12

MALARIA.

Malaria, which invariably is the principal cause of sickness among the troops, was less marked than in the previous year, due to the fact that the incidence of malaria in the Sudan as a whole was less than in the previous year and to the fact that troops were not disposed to the same extent in areas in which malaria is highly endemic.

The following table shows the admissions for malaria during the past ten years :—

YEAR.	Cases.	Ratio per 1,000 of strength.
1928	698	98.5
1929	1,165	165.86
1930	706	108.16
1931	741	138.94
1932	810	167.7
1933	1,140	231.77
1934	1,185	272.5
1935	894	187.5
1936	977	220.04
1937	748	168.31

BLACKWATER FEVER.

One case of blackwater fever occurred at Shendi. The disease was contracted in Kurmuk, where the Sudan Horse were stationed for some time, and proved fatal.

LEISHMANIASIS.

The Gedaref-Gallabat area showed a further increase in the number of cases of leishmaniasis. 15 received treatment during the course of the year.

SMALLPOX.

Although smallpox was prevalent in certain parts of the Sudan only one case occurred among the troops. Vaccination of all troops was systematically carried out. T.A.B. inoculation is given every second year.

MUMPS.

All units were affected by mumps, a total of 52 cases having occurred in comparison with 7 in the previous year.

VENEREAL DISEASES.

The figures, which total 550, are higher by 84 than those of last year. They are approximately identical with those for 1935 and 1934. The increase in gonorrhoea was most marked in the Kordofan area and Torit, but steps have been taken for frequent inspections and treatment of all cases which it is hoped will reduce the incidence.

YEAR.	ARABS.		EQUATORIAL.	
	Admissions.	Ratio per 1000 of strength.	Admissions.	Ratio per 1000 of strength.
1928	611	89.48	86	69.8
1929	646	111.09	80	58.73
1930	685	106.91	64	46.98
1931	594	135.4	49	51.81
1932	570	143.0	57	67.69
1933	595	145.44	52	62.8
1934	561	144.3	32	38.6
1935	501	128.7	58	69.6
1936	457	124.6	51	65.9
1937	520	141.9	72	92.3

The following table shows the admissions by diseases in the various stations :—

ADMISSIONS TO HOSPITALS FOR N.C.Os. AND MEN DURING 1937.

	T.B. Pulmonary	T.B. Non-Pulmonary	Syphilis	Gonorrhoea	Soft Sore	Trachoma	All Other Eye Diseases	Ear	Skin	Wounds and Other Injuries	Non-Malignant Tumours	Poisoning	Ancylostomiasis	Bilharziasis	Dysentery Amoebic	Malaria	Leishmaniasis	Yaws	Dracontiasis	Tropical Ulcer	Smallpox	Chickenpox	Influenza	Mumps	Measles	Pneumonia	Rheumatic Fever	Enteric Fever	Circulatory System	Respiratory System	Alimentary System	Genito-Urinary System	Nervous System	Fever of Unknown Origin	All Other Diseases	Total
Khartoum	1	2	20	49	6	6	5	1	2	130	—	—	—	21	9	47	—	—	—	—	—	4	4	6	1	6	—	—	1	12	11	12	4	20	68	448
Shendi	—	—	7	39	2	8	15	2	1	111	1	—	1	7	6	71	—	—	—	—	—	3	—	6	—	2	3	—	2	34	37	3	—	37	38	436
El Obeid	1	—	14	53	7	—	9	1	—	32	—	—	—	—	21	136	1	—	—	—	—	1	—	5	—	7	—	—	4	20	15	8	4	—	10	349
Bara	—	—	20	8	3	—	2	—	1	32	—	—	—	—	—	35	—	—	—	—	—	8	4	—	1	—	—	—	2	7	9	6	4	—	5	147
Kadugli	—	—	6	19	—	—	—	2	—	18	—	—	—	—	9	39	—	—	—	—	—	—	4	—	—	—	—	—	—	13	1	—	1	—	4	116
Dilling	—	—	5	13	—	—	—	—	7	33	—	—	—	—	1	20	—	—	—	—	—	—	—	5	—	—	—	—	—	—	—	—	—	—	13	97
Kassala	—	—	9	7	3	—	7	2	—	28	—	—	—	—	11	36	—	—	—	—	—	—	3	2	—	2	1	—	1	4	5	—	—	3	7	131
Gedaref and Gallabat	—	—	26	59	1	11	3	1	9	87	2	—	—	—	11	68	15	—	—	—	1	27	—	—	—	15	—	—	3	59	23	7	9	5	72	514
Fasher	—	—	24	59	—	—	3	—	—	32	—	1	—	—	7	111	—	—	—	—	—	2	25	8	—	—	—	1	1	8	8	—	1	38	10	339
Geneina	—	—	12	28	—	—	4	—	11	53	—	—	1	1	11	66	—	—	—	—	—	2	—	—	1	2	—	—	—	14	5	1	—	—	3	215
Nyala	—	—	8	9	4	—	7	—	1	39	—	—	—	—	—	60	—	—	1	—	—	—	—	—	9	3	—	—	1	1	1	5	—	—	9	158
Torit	—	—	1	20	4	1	13	3	8	106	3	2	—	—	33	33	—	1	13	1	—	—	24	20	—	4	—	—	1	12	19	1	—	—	11	334
Kapoeta and Boma	—	—	—	2	—	—	2	—	—	57	—	—	—	—	6	10	1	1	6	—	—	—	14	—	—	2	—	—	—	6	2	—	1	5	16	131
Taali	—	—	7	1	—	—	—	—	—	42	—	—	—	—	2	13	—	—	23	—	—	—	—	—	—	2	—	—	—	10	—	—	—	—	5	105
Wau	—	—	1	19	2	—	—	—	—	16	—	—	—	—	1	1	—	—	2	—	—	—	—	—	—	—	—	—	—	5	—	—	—	9	22	78
Aweil	—	—	1	14	—	—	—	—	—	6	—	—	—	—	—	2	—	—	—	—	—	—	—	—	—	—	—	—	—	3	—	—	—	—	14	40
TOTAL	2	2	161	399	32	26	70	12	40	822	6	3	2	29	128	748	17	2	45	1	1	47	78	52	12	45	4	1	16	208	136	43	24	117	307	3,638

THE FOLLOWING TABLE SHOWS THE SICK RATE, ADMISSIONS, ETC., BY STATIONS.

STATION.	Average Annual Strength.	Admissions.	Total No. of days Sickness.	Average Constantly Sick.	Average No. Days lost through sickness	
					Whole Force.	Those sick.
Khartoum	800	448	7,215	2.4	9.0	16.1
Shendi	516	436	4,001	2.1	7.7	9.1
El Obeid	474	349	4,163	2.4	8.7	11.9
Bara	166	147	1,558	2.5	9.3	10.6
Dilling	167	97	1,455	5.2	19.1	15.0
Kadugli		116	1,740			
Kassala	194	131	1,469	2.0	7.6	11.2
Gedaref	586	514	5,800	2.7	9.9	11.2
Fasher	365	339	3,991	2.9	10.9	11.7
Geneina	198	215	2,051	2.8	10.3	9.5
Nyala	198	158	2,675	3.7	13.5	16.9
Torit	351	334	3,824	2.9	10.9	11.4
Kapoeta & Boma	143	131	1,263	2.4	8.8	9.6
Taali	86	105	1,186	3.7	13.8	11.3
Wau	200	78	1,241	2.3	8.6	14.5
Aweil		40	475			
TOTALS	4,444	3,638	44,107	2.72	9.92	12.12

HISTORICAL SURVEY OF THE DEVELOPMENT OF THE SUDAN MEDICAL SERVICE.

The Medical Service of the Sudan has now developed into the organisation foreseen many years ago and it seems an appropriate opportunity to give a short historical survey of the Service.

The Sudan has an area of about a million square miles and is bounded on the north by Egypt, the east by Eritrea and Abyssinia, the south by Uganda and the Belgian Congo, and on the west by French Equatorial Africa and Libya. The population which was estimated at under two millions after the conquest of the country in 1899, is now about five and three quarters millions.

After the re-occupation of the Sudan the Government of the country was carried out by military officers and military doctors carried out the medical work throughout the Sudan. At first this was confined to the treatment and medical supervision of troops and officials in their stations, with such sanitary work as was found necessary for this purpose.

As time went on the civil population, which had every reason from its previous experience of governments to fear them, became less suspicious and began to report sick at the military hospitals which had been established.

As this demand for medical treatment among the Sudanese grew, it became necessary to provide accommodation for civil cases and small civil hospitals of temporary construction were erected in those stations where there was a military hospital.

In 1904 a cadre of civil doctors was created to take over the civil medical work in the more civilised centres.

As must always be the case in the creation of a health service in a primitive country the medical work among the civil population was at first confined to curative medicine, and preventive medicine, other than extensive vaccination campaigns, was limited to the protection of the official population in the big towns such as Khartoum, Omdurman, Atbara and Port Sudan and, where possible, in the outstations.

There were, however, exceptions to this rule. In Khartoum, thanks to the perseverance and forceful personality of the late Sir Andrew Balfour, a model preventive service was established surprisingly early in the history of the service, which afforded protection to a population of 150,000. The Sudan will always be indebted to him for this achievement which has acted as an inspiring example up to the present day.

In the Lado Enclave, sleeping sickness, which had been prevalent when this area was taken over in 1911, was gradually eliminated by a vigorous campaign, except in the Kajo-Kaji district where it flared up in 1914.

This was the position at the beginning of the War and little further could be done until it had ended.

By 1918 a serious situation had developed as regards sleeping sickness along the borders of the French and Belgian Congos. This disease was introduced into the south western Sudan by Sudanese troops returning from the French Congo during the war. It showed every sign of becoming epidemic in these areas and, with the curative resources then available, this would have meant the extermination of the large population at risk.

To deal with this menace an organisation was hurriedly built up, staffed by British officers of the Royal Army Medical Corps and Syrian Officers of the Egyptian Army. The difficulties which had to be contended with were very great. Much of the infected country was in a remote, wild forest area and intensely malarious. The drastic measures of moving whole populations on to roads or into specially sited villages, building large settlements for treatment of cases and housing of officials, frequent medical inspections and all the sanitary precautions such as clearing of river beds and making safe watering places, were carried out by a small medical and political staff. There must have been few campaigns carried out as thoroughly under such difficult conditions and the surviving officials had the satisfaction of knowing that they had saved a population of about 200,000 from extermination and reduced the incidence of the disease to sporadic proportions only.

The organisation built up has been maintained, with such modification as experience showed necessary, up to the present day. The medical administration had developed by 1922 to the stage that a certain amount of medical work was being carried out in the bigger towns, with well developed public health services in Khartoum, Atbara and Port Sudan, and a special organisation was in being for dealing with sleeping sickness in the southern Sudan.

The Laboratory Services at this stage formed part of the Education Department as the Wellcome Medical Research Laboratories, and, thanks to th assistance of the late Sir Henry Wellcome, had developed considerably during the earlier years of the present administration and were already rendering valuable assistance.

The midwives training school was opened in 1922 and, by the devoted efforts of the Misses Wolff, gradually gained popularity among the prejudiced and conservative women of the northern Sudan.

The system of treatment of normal midwifery cases in their homes wherever possible, by certified midwives, has proved most satisfactory, both to the women themselves who much prefer to remain at home and to the hospital organisation because it avoids unnecessary crowding of wards.

Trained midwives are at present stationed in every province in the Sudan except Equatoria Province, where a midwives training school for the southern Sudan is now being organised at Juba. They form an invaluable means of introducing simple hygiene into the homes of the rural population.

The medical school which had been built and endowed as a memorial to Lord Kitchener, was opened in 1924 and since 1927 its graduates have been absorbed into the service where they have proved their worth. The success of this educational experiment must be largely attributed to the foresight and energy of Dr. Atkey, Director of Medical Services from 1922 to 1933, who spared neither effort nor time in ensuring its success.

The necessity for dispensaries to deal with remote areas, under an official capable of carrying out routine treatment and sufficiently trained to know his own limitations, had long been recognised and in 1922 a few dispensaries were opened under assistant medical officers, who were officials selected from among the best and most experienced hospital orderlies and given a two years theoretical, practical and clinical course followed by a qualifying examination. Dr. Hodson at the Civil Hospital Khartoum organised and taught the first classes of this cadre and their work since has been a credit to his teaching.

The inauguration of the Gezira irrigation scheme in 1927 introduced a major problem of preventive medicine and from the start every effort was made to keep out bilharzia and to reduce the incidence of malaria. The anti-malarial work was at first mainly centred on the 40 dispensaries scattered over the area, each in charge of an assistant medical officer, but later it was found more efficient to use purely sanitary staff for the purpose leaving the dispensaries to deal with the curative side. A large staff of British Sanitary Inspectors and subordinate Sudanese officials are stationed throughout the area. It is satisfactory to record that despite constant risk of infection the incidence of bilharzia remains negligible and is probably no higher among the indigenous population than it was before the irrigation scheme commenced, and that the epidemics of acute malaria, which used to sweep this area periodically after the rains, have been eliminated by the medical and sanitary precautions taken. Chronic malaria, although high, is gradually being reduced and is probably now little or no higher than before the scheme commenced.

About the same time the Sudan was invaded from the west by the worst epidemic in its recent history. Cases of relapsing fever were reported in Western Darfur in 1926 and within a year at least 10,000 deaths had occurred in Zalingei District alone. Every effort was made to prevent it spreading eastward and a large staff were employed in dealing with it.

By strenuous efforts it was confined to one Province–Darfur–a remarkable achievement as it had hitherto spread across Africa unchecked, but the mortality in that province was appalling.

For the next few years the dispensary and hospital systems were improved and extended rapidly, and every effort was made to bring medical facilities within reach of the whole population.

The new Stack Medical Research Laboratories were opened in 1927, and, under the inspiring direction of Sir Robert Archibald, became a model unit working in closest co-operation with the Medical Service.

Attention was next paid to leprosy and large voluntary settlements were organised in the endemic areas of the southern Sudan.

The military medical administration of the Sudan Defence Force and complete control of the civil work in the southern and western provinces, which had been previously administered by the Principal Medical Officer, Sudan Defence Force, were finally taken over by the Sudan Medical Service in 1932, and the Laboratories and Research in 1935. Special departments in obstetrics and gynaecology, and ophthalmology were created in Khartoum in addition to those already existing in medicine, surgery, public health and pathology.

The Medical Service organisation was then complete, consisting of three main sections—public health, hospitals and laboratories.

By 1935 it was apparent that the Sudan now had as adequate a system of hospitals and dispensaries as was necessary, or it could afford, and that curative medicine in the field would serve another, most useful purpose in sweetening the pill of preventive medicine which should follow. It should be mentioned however that a certain amount of preventive medical work was already being carried out by hospital and dispensary staffs.

A scheme was worked out to form a network of subordinate public health officials in all parts of the Sudan who would carry preventive medicine to the inhabitants of every area. There are two cadres of sanitary official of whom the senior receive the diploma of the Royal Sanitary Institute and are called sanitary officers. They have been trained at the Kitchener School of Medicine since 1933 branching off to special sanitary instruction after the first year of the medical course. The junior are called sanitary overseers and receive a training in the Public Health Service comparable to that of assistant medical officers in the curative section.

A school for the training of sanitary overseers for the southern Sudan has been organised at Juba and the preventive medical organisation now extends to every district in the Sudan.

More recently, opportunity has been given to the best of the sanitary overseers to qualify as sanitary officers.

The assistant medical officers in charge of dispensaries also receive training in public health and act as sanitary advisers in remote districts.

The present situation of the various sections of the Medical Service is as follows :—

Hospitals. The continual increase in work during the last sixteen years is now becoming less and it is likely that the figures will remain established at approximately the present figures, or may even show a reduction with the improvement of public health. The Sudan is spending as much as is justified on this section and adequate facilities for treatment are available for the bulk of the population. The present organisation is also adequate, from the point of view of preventive medicine, to act as a medical intelligence system and for the treatment of infectious and other diseases in the interests of public health. New areas of development, the Jebel Aulia Reservoir for example, will, of course, require additional hospital and dispensary facilities.

A marked improvement has taken place in hospital buildings during the last ten years. Major alterations are at present under way involving the transfer of complete hospitals in Khartoum and Kosti to other sites. It is hoped to bring all the hospital and dispensary buildings up to a satisfactory standard in the near future.

Public Health. The recent reorganisation of this section and the large increase in the numbers of staff and improvement of their training, has provided an adequate preventive medical service throughout the Sudan, and all that remains is to fill the few remaining gaps as trained staff become available and to provide additional staff for any new areas of economic development. In future it is hoped that, by stimulating their sanitary conscience, the local authorities will be encouraged to take the initiative in pressing for sanitary improvements advised by the local public health staff.

This is already occurring in many cases, and it is encouraging to note that the importance of public health is being generally appreciated.

Laboratories and Research. This section is now completely organised and is considered adequate for the requirements of the Sudan. Special attention has recently been paid to the hospital laboratories in the provinces and their efficiency is being increased by better training of their personnel.

Training. The medical school has proved a striking success, and the recent alteration of the course from four years to five is already having beneficial results. Arrangements are being made to obtain partial recognition by the Conjoint Board of the Royal Colleges to enable graduates to take the conjoint board qualifying examination after a further period of study of twelve months in England, and so qualify for attempting the higher examinations in Great Britain in special subjects. The only other new development in view will be the organisation of post-graduate study in Khartoum which will commence in 1939. Courses are in existence for all other cadres of hospital and public health officials —*i.e.*, sanitary officers, dispensers, assistant medical officers, sanitary overseers, nurses, midwives and male orderlies.

A recent addition to the medical buildings in Khartoum, which has already proved its value, both as regards teaching of students and propaganda among the people, is the Graphic Museum. Although it has only been opened for less than two years and is not yet complete there is no doubt that it is already a great asset to the service.

There are certain features of the development of the medical service which may be of general interest. Every effort was made to develop the hospital and dispensary service first in order to prepare the way for preventive medicine, which immediately followed, and it was possible to bring preventive medicine to the more primitive inhabitants only because of the personal confidence and popularity resulting from treatment. For these same reasons it has been found essential in the Sudan that the same medical official who is responsible for the hospitals in a province should also be responsible for public health.

It is likely that the medical service as a whole is now as fully developed in all its branches as is necessary and that the interests of public health in the near future may be better served by spending any additional funds available not directly on medical and public health administration, but indirectly on the improvement of urban and rural water supplies, sanitation and drainage, housing and food.

The standard of living of the Sudanese has been steadily improving for many years, and every effort must be made to accelerate this process by improving public health and general conditions of living. It is by this means that diseases such a tuberculosis and leprosy are being kept under control rather than by any direct medical measures, and it is by the same methods that they will be most effectively dealt with in the future. This fact requires emphasis as it is not always appreciated by those without knowledge of local conditions.

MEDICAL WORK CARRIED OUT BY MISSIONS.

The following table shows the work carried out by medical missions :—

	Inpatients	Outpatient Attendances	Operations
THE CHURCH MISSIONARY SOCIETY.			
Omdurman	1,318	96,171	279
Lui (Equatoria Province) ...	499	82,886	133
Zeraf Island (Upper Nile) ...	288	9,217	172
Sallara (Nuba Mountains) ...	62	8,029	—
THE SUDAN UNITED MISSION.			
Melut (Upper Nile)	364	3,900	40
Heiban (Nuba Mountains) ...	192	9,964	7
Abri (Nuba Mountains) ...	—	1,630	—
THE AMERICAN MISSION.			
Doleib Hill (Upper Nile) ...	20	10,176	—

STAFF & ORGANISATION.

(A) BRITISH STAFF.

Administration.

Director—who is responsible for the medical, public health, and medical research work carried out in the Sudan, and for the health of the Sudan Defence Force.

Assistant Director (Public Health) who deals with questions concerning preventive medicine.

Assistant Director (Hospitals) who deals with questions concerning curative medicine.

Assistant Director (Laboratories) who deals with laboratory and research work.

Superintendent
Chief Clerk
Superintendent of Accounts.
Chief Storekeeper
Assistant Storekeeper

Special Appointments.

Medical Specialist
Ophthalmic Surgeon
Medical Officer of Health, Khartoum.
Surgical Specialist
Obstetrical and Gynaecological Specialist
Medical Registrar seconded to the Kitchener School of Medicine.

Medical Staff.

33 Senior Medical Inspectors and Medical Inspectors. Matron, 4 Charge Sisters and 10 Nursing Sisters. Radiographer.

Public Health Staff.

12 Sanitary Inspectors.

Principal, Midwives' Training School and Assistant Principal Midwives' Training School.

Laboratories Staff.

2 Bacteriologists.
4 Laboratory Assistants.

(B) SYRIAN STAFF.

5 Medical Officers, who are being replacd by Sudanese.

2 Dispensers.

(C) SUDANESE STAFF.

Special Appointments.

1 Assistant Ophthalmic Surgeon.

1 Assistant Bacteriologists.

1 Medical Sub-Inspector.

Medical Staff.

53 Medical Officers who have been trained at the Kitchener School of Medicine.

248 Assistant Medical Officers. These are selected after several years' training as hospital orderlies, and given a course lasting a year. If they pass the requisite examiniation, they are placed in charge of dispensaries.

Hospital Orderlies **Female Nurses.**

Sheikhs' Dressers and Chiefs' Dressers. These men, who are selected by the Sheikh or Chief concerned from his tribe, carry out simple treatment and report epidemics among the nomad Arabs of the north and the pagan negro tribes of the south.

Public Health Staff.

Sanitary Officers (*See* pages 31-32) and **Sanitary Overseers** (*See* page 32).

Subordinate Sanitary Staff. (House-to-house inspectors, mosquito-men, etc.)

Midwives. These are trained at the Midwifery School, and practise under the supervision of the public health authorities.

Laboratories Staff.

Laboratory Assistants of whom 10 are working at the Stack Medical Research Laboratories, and the remainder at hospitals.

SUDAN MEDICAL SERVICE 1937.

Appointment.	Establishment.
Medical Staff.	
Director	1
Assistant Director (Public Health)	1
Assistant Director (Hospitals)	1
Senior Physician	1
Senior Surgeon	1
Obstetric Surgeon and Gynaecologist	1
Medical Officer of Health Khartoum	1
Ophthalmic Surgeon	1
Assistant Ophthalmic Surgeon	1
Senior Medical Inspectors	16
Medical Inspectors	16
Medical Sub-Inspector	1
Syrian Medical Officers	5
Sudanese Medical Officers	53
Assistant Medical Officers	248
Dispensers	3
Radiographer	1
Assistant Radiographers	2
Stack Medical Research Laboratories.	
Assistant Director, Laboratory Services	1
Government Bacteriologists	2
Laboratory Assistants (British)	4
Laboratory Assistants (Sudanese)	20
Nursing Staff.	
Principal, Midwives' Training School	1
Assistant Principal Midwives' Training School	1
Matron	1
Charge Sisters	4
Nursing Sisters	10
Sanitary Staff.	
Chief Sanitary Inspector	1
Senior Sanitary Inspectors	7
Sanitary Inspectors	5
Sanitary Officers	7
Sanitary Overseers	70
Clerical Staff.	
Superintendent	1
Staff Clerk	1
Clerks	16
Superintendent of Accounts	1
Chief Accountant	1
Book-keepers	52
Medical Stores Staff.	
Chief Storekeeper	1
Storekeeper (British)	1
Storekeepers (Sudanese)	6
Storemen	18
Tailor	1
Carpenter	1

BRITISH MEDICAL STAFF

SUDAN MEDICAL SERVICE.

ON 31. 12. 1937.

Director,	Mr. E. D. Pridie, D.S.O., O.B.E., M.B., B.S., 3N.
Asst. Director (Public Health)	Mr. H. A. Crouch, O.B.E., M.C., M.R.C.S. L.R.C.P., D.P.H.
Asst. Director (Hospitals)	Mr. N. MacLeod, M.B., Ch.B., 4N.
Registrar, School of Medicine	Mr. D. R. Macdonald, M.B., Ch.B.

SPECIALIST APPOINTMENTS.

Senior Physician	Dr. R. M. Humphreys, D.M., B.Ch., 4N.
Senior Surgeon	Mr. F. S. Mayne, M.B., F.R.C.S.E.
Obstetric Surgeon and Gynaecologist	Mr. J. S. Hovell, M.B., F.R.C.S.E., M.C.O.G.
Ophthalmic Surgeon	Mr. A. R. McKelvie, M.B., Ch.B.
Medical Officer of Health	Mr. A.E. Lorenzen, M.R.C.S., L.R.C.P., D.P.H., 4N.

MEDICAL SECTION.

Senior Medical Inspector	Dr. A. Cruickshank, M.D. B.Ch., 4N.
,, ,, ,,	Mr. C. E. G. Beveridge, M.R.C.S., L.R.C.P., 4N.
,, ,, ,,	Mr. F. H. Goss, M.C., M.B., B.Ch.
,, ,, ,,	Dr. L. H. Henderson, M.D., Ch.B., D.T.M. & H.
,, ,, ,,	Mr. E. P. Pratt, M.B., B.S.
,, ,, ,,	Mr. G. D. Rankin, M.B., B.Ch.

Senior Medical Inspector	Mr. H. M. Elliott, B.Ch.
,, ,, ,,	Dr. J. Bryant, M.D., Ch.B., F.R.C.P.E., D.T.M. & H.
,, ,, ,,	Mr. C. B. Drew, M.R.C.S., L.R.C.P.
,, ,, ,,	Mr. J. S. Aldridge, M.R.C.S., L.R.C.P.
,, ,, ,,	Mr. E. W. T. Morris, F.R.C.S.
,, ,, ,,	Mr. H. M. Woodman, M.B., B.Ch.
,, ,, ,,	Mr. A. P. Farmer, M.B., B.S., D.T.M. & H.
,, ,, ,,	Dr. N. L. Corkill, M.M., M.D., Ch.B.
,, ,, ,,	Mr. G. J. Clarke, M.R.C.S., L.R.C.P., D.T.M. & H.
,, ,, ,,	Mr. L. Brown, M.R.C.S., L.R.C.P.
Medical Inspector	Dr. R. McN. Buchanan, M.D., Ch.B., D.T.M. & H.
,, ,,	Mr. H. Richards, M.B., B.S., D.T.M. & H.
,, ,,	Mr. E. K. Malone, M.B., B.Ch., B.A.O.
,, ,,	Mr. J. L. D. Roy, M.B., Ch.B.
,, ,,	Mr. F. Bartholomew, F.R.C.S.E.
,, ,,	Mr. R. W. Stephenson, M.R.C.S., L.R.C.P.
,, ,,	Mr. F. L. Wheaton, M.B., B.S.
,, ,,	Mr. J. F. E. Bloss, M.R.C.S., L.R.C.P., D.T.M. & H.
,, ,,	Mr. W. H. Greany, M.B., B.Ch.
,, ,,	Mr. A. Royland Hunt, L.R.C.P., L.R.C.S. (Ed.)
,, ,,	Mr. R. B. U. Somers, M.B., Ch.B., D.T.M. & H.
,, ,,	Mr. W. F. Townsend Coles, M.B., B.S.
,, ,,	Mr. R. T. Campbell, M.B., Ch.B.
,, ,,	Mr. H. D. Fairman, M.B., B.S.
,, ,,	Mr. C. A. Lewis, M.R.C.S., L.R.C.P.
,, ,,	Mr. E. O'D. C. Grattan, M.B., B.Ch., F.R.C.S.

STACK MEDICAL RESEARCH LABORATORIES.

Asst. Director Laboratory Services	Dr. E. S. Horgan, B.A., M.D., B.Ch., B.A.O.
Bacteriologist	Mr. R. Kirk, M.B., Ch.B., B.Sc., F.R.F. P.S.G., D.P.H.

TABLE I.

SHOWS ADMISSIONS AND DEATHS BY DISEASES.

DISEASE.	TOTAL.							
	Europeans.				Non-Europeans.			
	Male.		Female.		Male.		Female.	
	A.	D.	A.	D.	A.	D.	A.	D.
Table "A"								
Tubercular								
1. Disease of lung	2	—	—	—	367	107	119	41
2. All other tubercular diseases ...	—	—	—	—	274	25	121	15
Venereal								
3. Syphilis	—	—	—	—	5,717	27	4,118	16
4. Gonorrhoea	9	—	—	—	2,341	5	466	2
5. Soft sore	—	—	—	—	517	—	56	—
Eye.								
6. Trachoma...	—	—	—	—	700	—	376	—
7. All other eye diseases	2	—	2	—	2,730	—	1,544	—
8. **Ear**	1	—	—	—	368	3	152	2
9. **Skin**	3	—	—	—	1,169	2	894	3
10. **Wounds and other injuries** ...	39	1	5	—	15,301	179	5,534	44
Tumours.								
11. Malignant	—	—	—	—	96	19	81	14
12. Non-malignant	—	—	—	—	301	2	270	6
Of Women.								
13. Gynaecological	—	—	7	—	—	—	920	15
14. Confinements	—	—	16	—	—	—	573	35
15. **Poisoning**	—	—	—	—	110	6	50	1
Total Table "A" ...	56	1	30	—	29,991	375	15,274	194
Table "B" (Tropical).								
1. Ankylostomiasis	—	—	—	—	632	9	188	2
2. Bilharziasis	—	—	—	—	1,619	7	305	1
3. Blackwater Fever	—	—	—	—	15	3	2	—
4. Dysentery, Amoebic	8	—	4	—	1,858	32	638	13
5. Dysentery, Bacillary	4	—	1	—	123	4	10	4
6. Filariasis	—	—	—	—	378	1	104	—
7. Madura Disease	—	—	—	—	625	3	151	—
8. Malaria	27	—	2	—	6,851	36	1,103	3
9. Leishmaniasis (Kala-Azar) ...	—	—	—	—	283	47	53	10
10. Trypanosomiasis...	—	—	—	—	64	1	25	—
11. Yaws	—	—	—	—	837	2	532	2
12. Sunstroke...	—	—	—	—	—	—	1	—
13. Heatstroke	—	—	—	—	2	1	—	—
14. Guinea-worm	—	—	—	—	566	1	165	—
15. Tropical ulcer	—	—	—	—	2,024	—	1,476	—
Total Table "B"	39	—	7	—	15,877	147	4,753	35

TABLE I. (*Continued*).

Disease.	TOTAL.							
	Europeans.				Non-Europeans.			
	Male.		Female.		Male.		Female.	
	A.	D.	A.	D.	A.	D.	A.	D.
Table “ C ” (Infective).								
1. Anthrax	—	—	—	—	—	—	—	—
2. Beri-beri	—	—	—	—	—	—	—	—
3. Cerebrospinal meningitis ...	—	—	—	—	156	45	27	5
4. Chicken Pox	—	—	—	—	824	1	134	—
5. Cholera	—	—	—	—	—	—	—	—
6. Dengue	1	—	—	—	1	—	—	—
7. Diphtheria...	—	—	1	—	8	3	16	5
8. Enteric (including paratyphoid)	2	2	—	—	101	8	62	7
9. Erysipelas	—	—	—	—	5	2	5	1
10. Gastro enteritis of children ...	1	—	—	—	150	9	28	1
11. Influenza	17	—	6	—	1,046	14	311	4
12. Leprosy	—	—	—	—	417	39	32	—
13. Malta fever	—	—	—	—	30	1	3	—
14. Measles	—	—	—	—	28	1	1	—
15. Mumps	2	—	—	—	1,029	—	160	—
16. Pellagra	—	—	—	—	18	1	3	—
17. Puerperal fever	—	—	—	—	—	—	23	4
18. Phlebotomus Fever	—	—	—	—	4	—	—	—
19. Plague	—	—	—	—	—	—	—	—
20. Pneumonia (epidemic)	1	—	—	—	1,994	242	478	41
21. Rabies	—	—	—	—	144	4	70	2
22. Relapsing fever	—	—	—	—	359	47	15	1
23. Rheumatic fever	—	—	—	—	175	1	99	1
24. Small pox	—	—	—	—	196	16	12	2
25. Tetanus	—	—	—	—	16	7	2	1
26. Typhus	—	—	—	—	—	—	—	—
27. Whooping cough	—	—	—	—	20	—	12	—
Total Table “ C ” ...	24	2	7	—	6,721	441	1,493	75
Table “ D.”								
1. Circulatory system	4	—	2	—	792	96	378	49
2. Respiratory system	29	1	1	—	3,343	225	539	36
3. Alimentary system	63	1	19	—	3,989	192	1,580	57
4. Genito-urinary system	27	—	2	—	2,349	76	540	9
5. Nervous system	7	1	1	—	426	18	152	11
6. Scurvy	—	—	—	—	17	—	2	—
7. Diabetes	3	—	—	—	81	6	18	1
8. Fever of uncertain origin ...	22	—	—	—	943	33	108	7
9. All other diseases	44	—	18	1	6,629	64	4,688	20
Total Table “ D ”	199	3	43	1	18,569	710	8,005	190
,, ,, “ A ”	56	1	30	—	29,991	375	15,274	194
,, ,, “ B ”	39	—	7	—	15,877	147	4,753	35
,, ,, “ C ”	24	2	7	—	6.721	441	1,493	75
Grand Total	318	6	87	1	71.158	1,673	29,525	494

TABLE II.

SHOWS ADMISSIONS AND DEATHS IN HOSPITALS DURING 1937.

	EUROPEANS.			NON-EUROPEANS.		
	Adm.	Died	%	Adm.	Died.	%
Blue Nile Province :—						
Wad Medani	81	—	—	4,674	247	5.28
Wad Medani prison ...	—	—	—	836	6	0.71
Abu Usher	—	—	—	2,110	69	3.27
Sennar	—	—	—	1,385	68	4.90
Singa	—	—	—	1,039	60	5.77
Roseires	—	—	—	795	25	3.14
Province dispensaries ...	—	—	—	394	3	0.76
Darfur Province :—						
Fasher	—	—	—	2,278	47	2.06
Geneina	—	—	—	2,403	14	0.58
Nyala	—	—	—	401	7	1.74
Province dispensaries ...	—	—	—	6,922	16	0.23
Equatorial Province :—						
Juba	5	—	—	2,628	42	1.59
Yei...	—	—	—	474	15	3.16
Torit	—	—	—	1,339	11	0.82
Kapoeta	—	—	—	780	11	1.41
Li Rangu	—	—	—	1,815	25	1.37
Meridi	—	—	—	1,612	17	1.05
Source Yubo	—	—	—	971	13	1.33
Wau	—	—	—	2,378	48	2.01
Rumbek	—	—	—	1,146	54	4.71
Province dispensaries ...	—	—	—	15,159	121	0.79
Kassala Province :—						
Kassala	—	—	—	2,375	98	4.12
Gedaref	—	—	—	1,808	39	2.15
Port Sudan	103	4	3.88	3,473	123	3.54
Port Sudan prison ...	—	—	—	215	12	5.58
Suakin	—	—	—	106	—	—
Suakin quarantine ...	—	—	—	85	5	5.88
Province dispensaries ...	—	—	—	692	12	1.73
Khartoum Province :—						
Khartoum	157	2	1.27	2,979	194	6.47
Omdurman	—	—	—	2,794	114	4.08
Khartoum North ...	—	—	—	994	20	2.01
River Hospital	—	—	—	1,681	8	0.47
Kordofan Province :—						
El Obeid	8	—	—	2,120	131	6.17
Nahud	—	—	—	985	34	3.45
Kadugli	—	—	—	1,407	38	2.70
Talodi	—	—	—	950	16	1.68
Dilling	—	—	—	1,516	23	1.51
Province dispensaries ...	—	—	—	10,557	86	0.81

TABLE II—(*Continued*).

	EUROPEAN.			NON-EUROPEANS.		
	Adm.	Died	%	Adm.	Died.	%
Northern Province :—						
Atbara	40	1	2.50	2,299	67	2.91
Shendi	—	—	—	850	6	0.70
Merowe	—	—	—	751	33	4.39
Dongola	—	—	—	804	22	2.73
Wadi Halfa	—	—	—	1,142	31	2.71
Province dispensaries ...	—	—	—	498	9	1.80
Upper Nile Province :—						
Malakal	11	—	—	4,149	50	1.21
Province dispensaries ...	—	—	—	1,740	—	—
White Nile Province :—						
Dueim	—	—	—	995	43	4.32
Kosti	—	—	—	1,179	34	2.88
TOTAL	405	7	1.72	100,683	2,167	2.15

GRAND TOTAL ... 101,088 admissions, with 2,174 deaths.

TABLE III.

SHOWS INPATIENTS, OUTPATIENTS, ENDEMIC DISEASES AND OPERATIONS DURING 1936 AND 1937.

PROVINCE.	Hospitals	Dispensaries	Inpatients.		Outpatients.		Bilharziasis.		Trachoma.		Ancylostomiasis.		Malaria.		Syphilis and Yaws.		Operations.	
			1936	1937	1936	1937	1936	1937	1936	1937	1936	1937	1936	1937	1936	1937	1936	1937
Blue Nile ...	5	76	11,418	11,314	1,026,551	1,042,519	1,630	2,260	34,890	35,755	42	32	62,745	37,711	6,173	5,825	1,557	1,371
Darfur	3	18	10,182	12,004	257,164	282,696	828	886	6,706	6,934	48	45	2,240	7,237	9,929	10,124	737	769
Equatorial ...	9	78	24,970	28,307	1,006,270	1,151,016	610	820	972	10,148	2,008	2,277	5,093	6,283	8,592	13,394	2,028	2,006
Kassala	4	36	7,557	8,857	527,329	538,949	72	286	30,855	28,438	195	28	22,996	15,330	8,125	6,256	1,487	1,435
Khartoum ...	4	18	9,130	8,605	705,477	700,940	466	534	58,563	57,782	102	127	4,370	4,703	1,818	1,342	2,073	2,618
Kordofan	5	32	17,264	17,543	800,663	985,181	2,147	2,630	7,290	9,391	36	20	20,982	18,818	23,212	21,118	1,292	1,419
Northern ...	5	51	7,450	6,384	1,649,598	1,498,350	4,096	3,875	112,235	105,653	427	441	49,125	39,078	3,490	5,746	1,150	1,065
Upper Nile ...	1	22	5,719	5,900	211,055	200,918	26	83	4,039	4,124	30	73	8,150	7,236	10,284	13,276	577	1,008
White Nile ...	2	15	2,391	2,174	316,334	275,420	983	600	12,465	4,349	59	1	14,042	8,298	5,948	4,710	328	372
TOTALS	38	346	96,081	101,088	6,500,441	6,675,989	10,858	11,974	268,015	262,574	2,947	3,044	189,743	144,694	77,571	81,791	11,229	12,063

TABLE IV.

LIST SHOWING HOSPITALS AND DISPENSARIES 1937.

Hospitals and Dispensaries	Beds. equipped	Hospitals and Dispensaries	Beds. equipped	Hospitals and Dispensaries	Beds. equipped
Blue Nile Province.		**Blue Nile Province**—*Contd.*		**Equatoria Province**—*Contd.*	
Wad Medani	256	Tayiba	—	Jambo	—
Abu Usher	150	Tebub	—	Kadiba	—
Sennar	127	Turabi	—	Kajo-Kaji	35
Singa	100	Turis	—	Kala	6
Roseires	100	Um Degarsi	—	Kashwal	—
Abdel Gelil	—	Wad El Ataia	—	Koggi	4
Abdel Hakam	—	Wad El Bur	—	Kuru	—
Abdel Magid	—	Wad Hussein	—	Kwajok	—
Abdel Rahman	—	Wad Medani Prison	33	Kyala	6
Abu El Hassan	—	Wad Naaman	—	Lafone	6
Abu Hashim	—	Wad Rawa	—	Larumba	—
Amara Kassir	—	Wad Saadalla	—	Lassa	6
Attib	—	Wad Sulfab	8	Lau	—
Bardana	—	Wisko	—	Lingasi	—
Bikori	—			Lita	6
Dar Agil	—	**Darfur Province**		Loa	6
Debeiba	—	Fasher	138	Loka	10
Derwish	—	Geneina	35	Lui	—
Dolga	—	Nyala	48	Lyria	6
Efeina	—	Abu Matarig	—	Mabenge	—
Fahal	—	Buram	—	Madol	—
Fawar	—	Garseila	—	Makapandu	—
Futais	—	Geneina Town	—	Malan	—
Galgani	—	Gorgor	—	Marial Bai	—
Gawada	—	Id El Ghanam	—	Meshra	—
Geissan	—	Kas	—	Migida	—
Ghubshan	—	Kebkebia	1	Mvolo	—
Gondal	—	Kubbum	—	Nderago	—
Gule	—	Kulbus	—	Ngere	—
Hag Abdalla	—	Kuttum	2	Ngindo	—
Hamad El Nil	—	Meidob	—	Noruga	—
Hassa Heissa	—	Mistiri	—	Nyin Akok	—
Hilalia	—	Radoom	—	Opari	10
Hosh	—	Um Buru	—	Pap	—
Istarihna	—	Um Keddada	—	Piele	—
Kab El Gidad	—	Wadaa	—	Pongo	—
Kamlin	—	Zalingei	18	Raga	15
Karkoj	4			Ruba	—
Keteir	—	**Equatoria Province.**		Said Bandas	—
Kumor	—	Juba	175	Shambe	40
Kurmuk	5	Wau	218	Sopo	—
Kurmuk Travelling Dispensary	—	Rumbek	108	Taali	14
		Li Rangu	130	Teitt	—
Laota	—	Source Yubo	80	Tembura	—
Launi	—	Yei	35	Terrakekka	6
Lokandi	—	Torit	63	Toinya	—
Mairono	—	Kapoeta	40	Toliang	4
Managil	—	Meridi	61	Tonj	11
Mealig	—	Agangwa	—	Wajo	—
Medina	—	Aluak-Aluak	—	Wandi Kammonde	—
Meringan	—	Atok-Tau	—	Walla	—
Messellamia	—	Avokaya	—	Wol Athiang	—
Mohammed Zein	—	Aweil	17	Wun Rog	—
Nidiana	—	Badagbo	—	Wun Shwai	—
Nueila	—	Badi	—	Yambio	—
Ora	—	Bakiri	—	Yirrol	30
Radma	—	Bazango	—	Zuba	—
Remeitab	—	Boma	10		
Roseires Travelling Dispensary	—	Buma	—	**Kassala Province.**	
		Dari	—	Kassala	159
Rufaa	—	Deim Zubeir	—	Port Sudan	143
Sabi Deleib	—	Dokobo	—	Gedaref (Civil)	70
Saoleil	—	Falwall	—	Gedaref (Military)	26
Seleima	—	Farajok	6	Abu Deleig	2
Sennar Junction	—	Gangura	—	Akik	—
Serio	—	Gamburn	—	Aroma	4
Shabarga	—	Gogrial	—	Car Dispensary	—
Suada	—	Hassen	—	Derudeib	4
Suki	—	Ibba	—	Digein	—
Tabat	—	Ikotos	6	Doka	1

TABLE V.—*Ctd.*

Hospitals and Dispensaries	Beds. equipped	Hospitals and Dispensaries	Beds. equipped	Hospitals and Dispensaries	Beds. equipped
Kassala—*Contd.*		**Kordofan Province**—*Ctd.*		**Northern Province**—*Ctd.*	
Galaat El Nahl	3	Bara	32	Kitiab	2
Gallabat	7	Buram	20	Korti	—
Gebeit	13	Delami	50	Mansurkotti	—
Gebeit Mine	—	Ermil	5	Metemma	—
Gheit	—	Gardud	10	Mograt Island	2
Goz Ragab	3	Ghabeish	5	Monassir	2
Goz Ragab Travelling Dispensary	—	Ghulfan	20	Nuri	—
Hadalyia	—	Hammadi	5	Sarras	—
Hawata	2	Heiban	20	Shendi Town Dispensary	—
Hillet Hokoma	—	Katla	20	Shereik	2
Hiseihisa	—	Kau	10	Sir	1
Kassab	—	Kauda	20	Suarda	—
Kassala Station	2	Keilak	2	Tayiba El Khawad	—
Khashm El Girba	2	Kilogi	10	Timeirab	—
Khashm El Girba Travelling Dispensary	—	Lagawa	13	Um Breika	4
Khatmia	—	Liri	20	Wad Hamed	4
Mefaza	—	Muglad	19	Zeidab	5
Mekali	—	Muglad Travelling Dispensary	—		
Metatib	—	Odaya	10	**Upper Nile Province.**	
Musmar	2	Rahad	23	Malakal	371
Oyo	—	Rashad	20	Abwong	9
Port Sudan Prison	13	Shawai	10	Akobo	20
Port Sudan East Side	—	Sherkeila	—	Bor	10
Shellag	—	Soderi	6	Detwok	6
Showak	2	Sug El Gamal	5	Doleib Hill	—
Sinkat	—	Tira Limon	5	Duk Faywil	—
Suakin	10	Um Barambeita	10	Fungak	6
Suakin Quarantine	30	Om Dorein	20	Gambeila	5
Tendelai	—	Um Ruaba	50	Kaka	8
Tokar	18			Kodok	13
		Northern Province.		Kongor	8
Khartoum Province.		Atbara	157	Ler	—
Khartoum	181	Wadi Halfa	86	Lul Mission	4
Khartoum North	35	Shendi	71	Melut	10
Omdurman	160	Merowe	72	Nasser	5
River Hospital	192	Dongola	64	Pibor	—
Ailafoun	—	Abidia	—	Renk	9
Burri	—	Abri	—	Rom	—
Deims	—	Abu Hamad	6	S.S. Kerreri	3
Deim Saad	—	Akasha	—	S.S. Lady Baker	22
Geili	1	Aliab	—	Tonga	12
Gereif (East)	—	Amka	—	Yoynyang Mission	6
Gereif (West)	—	Atmour	2		
Gordon's Tree	—	Attiri	—	**White Nile Provinee.**	
Gordon College	—	Argin	—	Dueim	52
Halfayat El Meluk	—	Argo	—	Kosti	50
Jebel Aulia	—	Amentego	—	Abu Rukba	—
Kheleila	—	Badein	—	Dar El Ahamda	—
Khartoum North Prison	37	Berber	8	Dar El Salam	1
Kober	—	Bouga	4	Gebelein	1
Mogren	—	Damer	1	Geteina	3
Murada	—	Darmali	—	Gulli	—
Omdurman Technical School	—	Debba	—	Kawa	—
Serurab	—	Delgo	—	Maatuk	1
Tuti	—	Dikka	—	Naaima	1
Wad Nubawi	—	Dobeira	—	Rahmania	2
		Eneibis	3	Shawal	—
Kordofan Province.		Fareig	—	Shigeig	1
Obeid	150	Gadalla	2	S.R. Car Dispensary	—
Nahud	88	Gandettu	2	Tendelti	—
Kadugli	100	Ghaba	—	Turaa	1
Dilling	100	Gureir	—		
Talodi	100	Haffir	—		
Abbasia	20	Halfa Degeim	—		
Abu Gebeiha	10	Hilgi	—		
Abu Zabad	30	Kabushia	—		
		Kareima	—		
		Khandak	—	Total Beds Equipped	5,494

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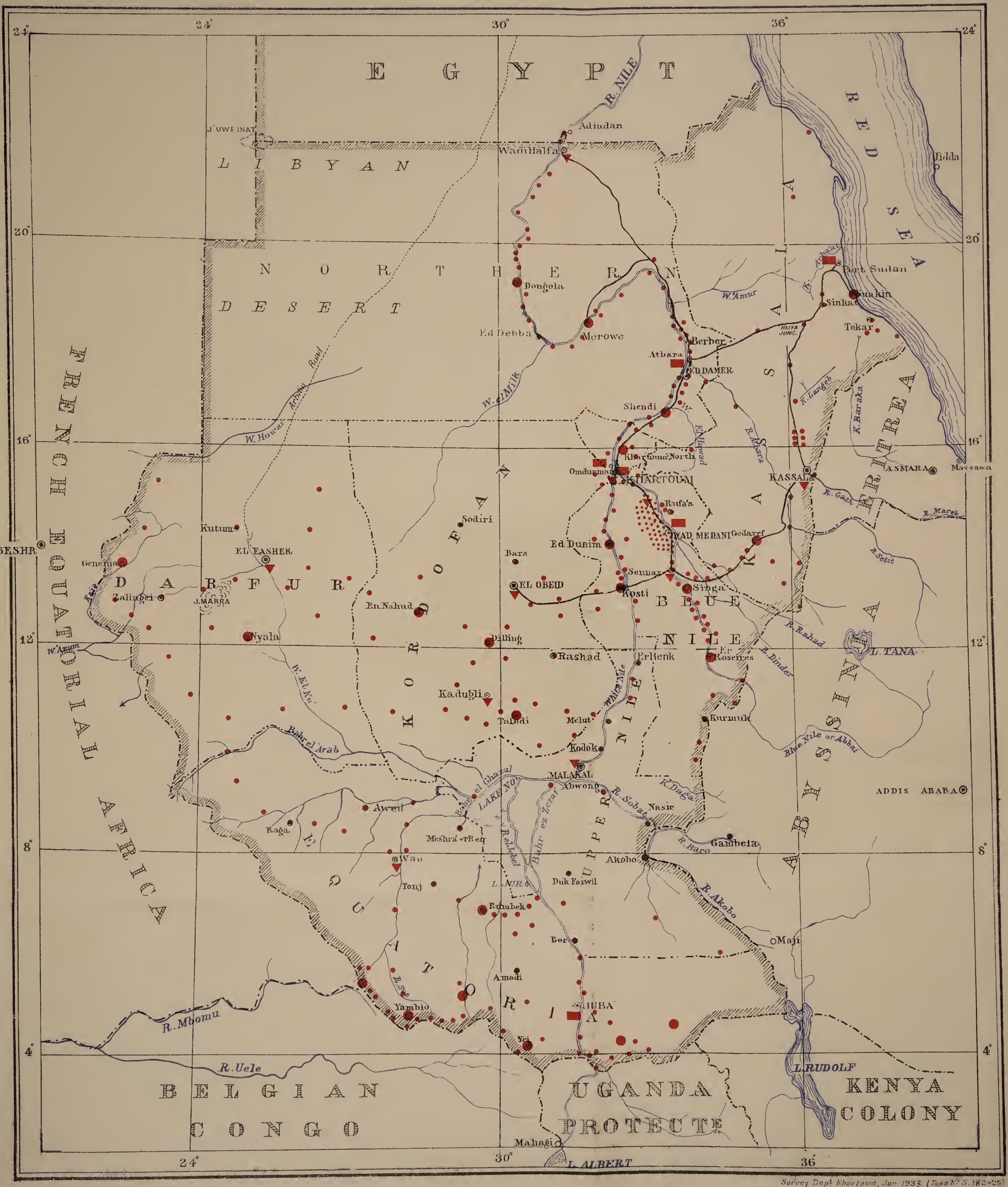
THE ANGLO-EGYPTIAN SUDAN



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